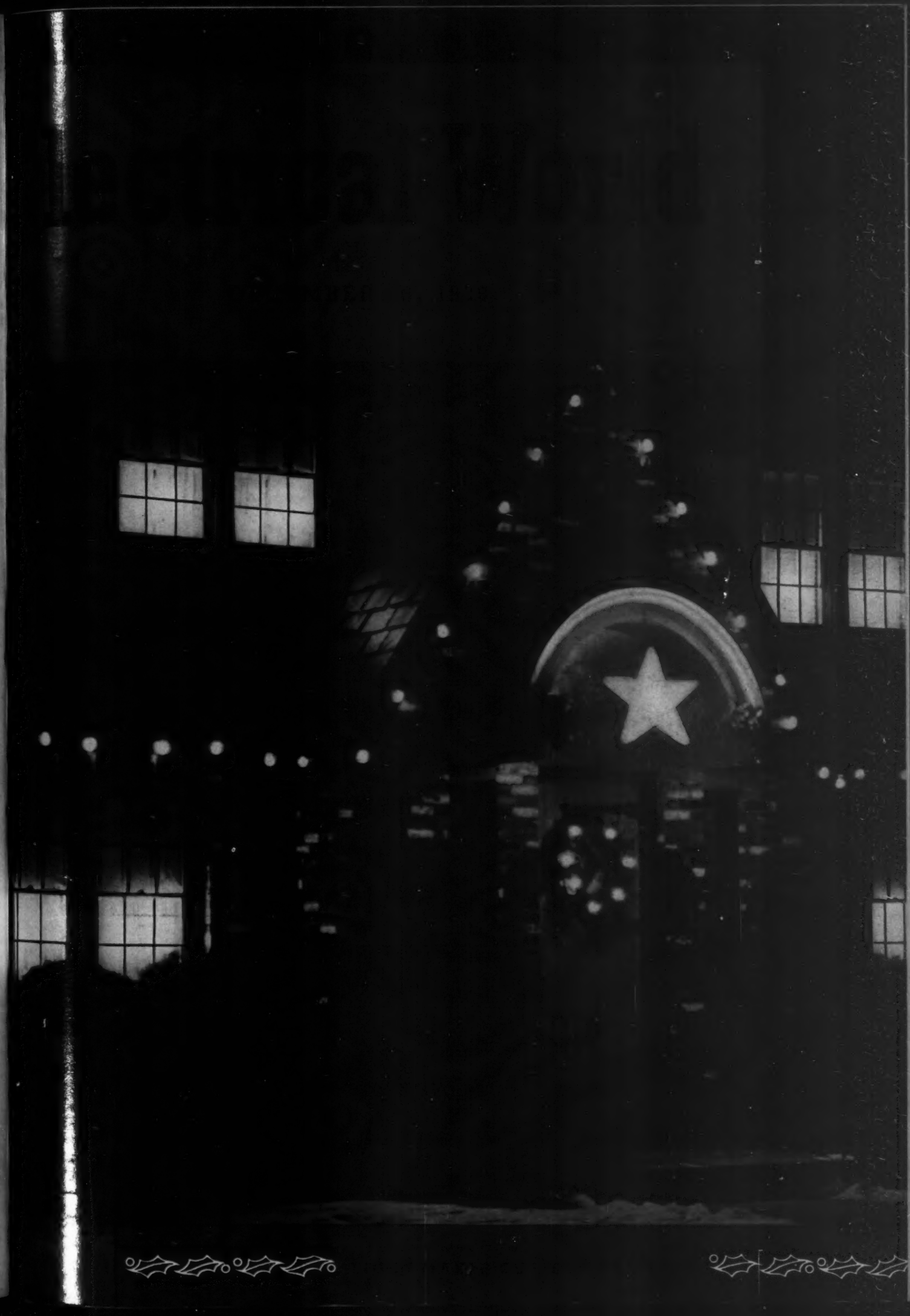

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A time-saver in maintenance work. Current reading obtained simply by placing clamping jaws around conductor. Circuits never disturbed. 6 current ranges. High insulation for complete protection.

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Not a Problem but an Opportunity

Because of the degree of saturation refrigerator sales may not reach the 1937 peak for some time. Meanwhile replacements are increasing and now amount to a quarter of the annual sales. The new units are much more efficient than the older ones. Likewise, fluorescent lighting is growing, another more efficient means for using electric energy. And now the new 1940 electric range models show lower current consumption than older models.

The trend in appliances is definitely to designs that not only give the consumer more for his money in first cost but are saving in operating expense. It is distinctly a trend in the right direction.

From the standpoint of residential current consumption, however, this trend does present a problem: How to build up average residential consumption in the face of constantly improving efficiencies and growing replacement volume?

The answer must be obvious—expand the use into now unreached income groups and find additional load-building devices for promotion. The manufacturers have helped considerably to bring low-income homes nearer as a market by a steady succession of price reductions. More, however, must be done in this direction, and perhaps through new design, before sufficient added sales can be developed to offset the substantial consumption losses due to replacements.

While there will probably be some utility men who will oppose this trend toward more efficient devices, the majority will accept it as progress. They will acknowledge the benefits to the consumer and make every effort to sell more.

There is another side, however, that has value when properly presented, and that is the public relations angle. For years the utility industry has talked about rate reductions, and the accomplishment has been something to talk about. Equally and in some cases of greater importance in customer cost has been the improvement in the device, not only as to operating characteristics but as to operating cost.

When in addition to reducing rates a utility promotes a device that actually uses less current the customers ought to know why. The dealer will sell lower light bills and, though unconsciously, will in so doing help the customer to believe that rates are high. There is no way this can be overcome except by the utility taking the initiative by boasting of its practice in bringing more efficient devices to its customers.

Already fluorescent lighting has been embarrassing to utilities in some instances because dealers and others have sold not so much a means of better lighting as a way to cut the light bills. That no real saving was possible in most cases was immaterial. The harm was done.

While more efficient devices at the moment may seem to offer some load-building problems, they might better be viewed as offering opportunities—opportunities to sell more and by sales direction to improve dealer technique, as well as opportunities to convince the customers that utilities really are service companies.

Carrier Telemetering Simplifies Dispatching

Reduces toll calls and cuts out labor of vocally transmitted readings by local operators — Continuous readings are afforded — Communication over the same channels — No bypasses are required

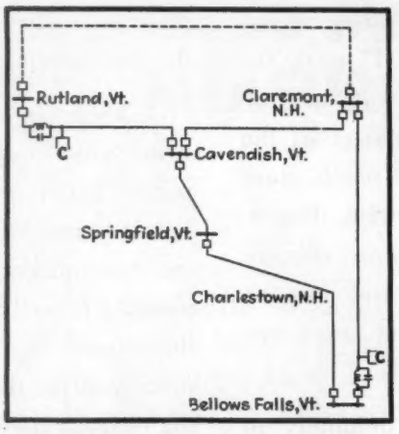
H. L. DURGIN, *Chief Engineer Central Vermont Public Service Corporation, Rutland*

THE major supply of prime energy required to firm the hydro-electric generating stations of the Central Vermont Public Service Corporation is taken over two 44-kv. lines between Charlestown, N. H., and Bellows Falls, Vt. The Central Vermont dispatchers at Rutland must at all times possess accurate knowledge of the amount of energy transfer over these circuits. Prior to the reconstruction of the Claremont-Charlestown line there was a private telephone line on transmission poles between Claremont and Bellows Falls. At that time the Claremont operators checked this load at frequent intervals with Bellows Falls and relayed the information to the Rutland dispatcher. During certain periods when the Claremont operators were occupied with other duties the infrequency of these load checks left much to be desired, so that when this transmission line was rebuilt the telephone line was discontinued.

Toll Calls Burdensome

Since a substantial part of the total load taken from Bellows Falls (New England Power System station) comes into this system via an unattended substation at Springfield, Vt., the discontinuance of the telephone circuit made it necessary for the dispatcher to estimate the amount of the Springfield load to be added to that being received at Claremont, or, as an alternative, meant that the dispatcher would have frequent toll calls to Bellows Falls to determine this figure. This, too, was unsatisfactory because of the inaccuracy on the one hand and the delay and expense on the other.

To overcome these objections some means was sought of obtaining at Rutland the reading of total load being transmitted from Bellows Falls and at the same time, if possible, provide more adequate communication facilities between these two points.



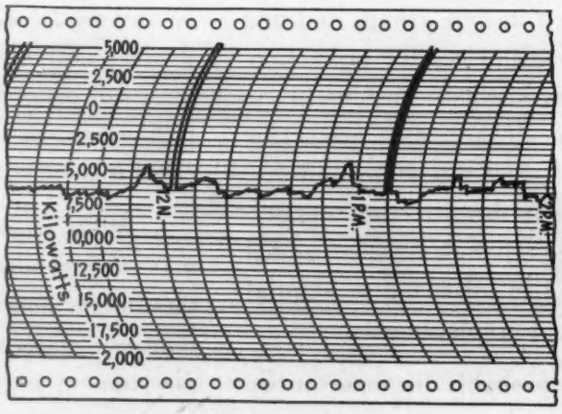
General layout of transmission lines between Bellows Falls and Rutland

Two solutions were considered, the installation of telemetering equipment to operate over a line leased from the telephone company and the same equipment to operate over existing transmission lines by means of carrier coupling. In both instances telephone service would also be available.

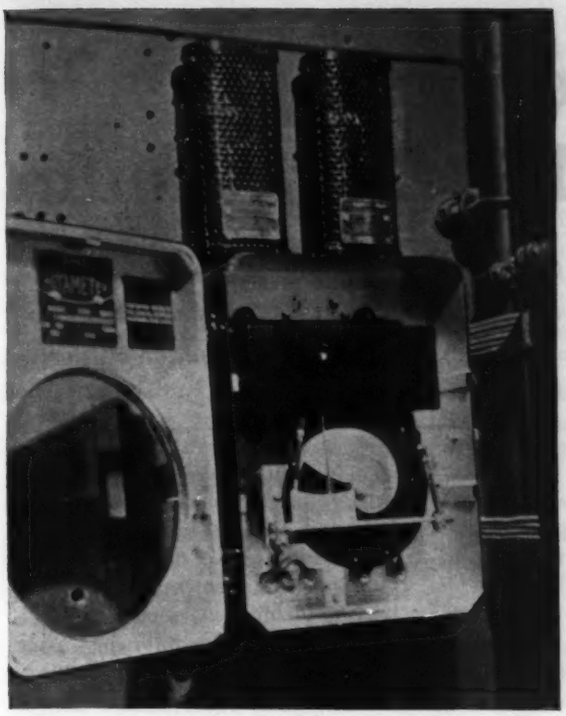
Carrier Satisfactory

Since 1935 the company has employed carrier-current telephone communication for several of its stations with extensions to its main offices in two locations. Generally speaking, this has been very satisfactory and has been a safe and reliable means of communication even during severe storms. Certain advantages of this system over the use of private lines are evident, since during any trouble it is only necessary to check a particular station to remedy the difficulty, thus eliminating patrol and testing of long duration. It was finally decided to use carrier-current apparatus for communication and superimpose on this a telemetering device.

The carrier-current telephone consists of two General Electric Co. KCA4 sets with phase-to-ground coupling, as shown in an accompanying illustration. The capacitor coupling is at Bellows Falls and at Rutland. Although the two 44-kv. circuits from Bellows Falls tie in at two different points on a loop of approximately 150 miles in circumference, it was only necessary to install wave traps at two points, Rut-



Typical kilowatt transmission record; telephone conversations cause dashes



Transmitter at Bellows Falls Station

land and Bellows Falls. The resultant signal strength was so high that at least one of these traps could probably have been eliminated, except for carrier interference with future additions to the carrier-current system. The distance covered by this carrier system is approximately 65 miles.

"Metameter" Adopted

The Bristol Company's "Metameter" was selected as a telemetering device to operate with the carrier-current equipment. This Metameter design consists mainly of an indicating wattmeter which acts through a medium of a relay and two clutch devices acting as a receiver.

The transmitter is located at the Bellows Falls station and indicates the total load on the two circuits. Suspended from the wattmeter element is a long arm which is similar to certain curve-drawing meters. This arm swings in front of a cam rotating at constant speed in a counter clockwise direction. As this cam comes around in back of the indicating arm the arm is lifted and rides on the surface of the cam until it drops off at the outer edge. During this interval a contact is made by a mercury switch and an impulse is sent over the carrier to the receiver at the dispatching office. One receiver clutch arrangement is energized for this length of time and notches up the recorder. During the length of time this signal is off another clutch checks the time and also notches the recorder in the correct direction. The signal time may be varied from maximum of fifteen seconds to a minimum of approximately five seconds as desired. The clutch devices are calibrated to the length of time the signal will be off and on for a certain position of the indicating arm. As the indicating arm moves farther toward the outer edge of the rotating cam the time that the signal is on increases, which varies the receiver accordingly.

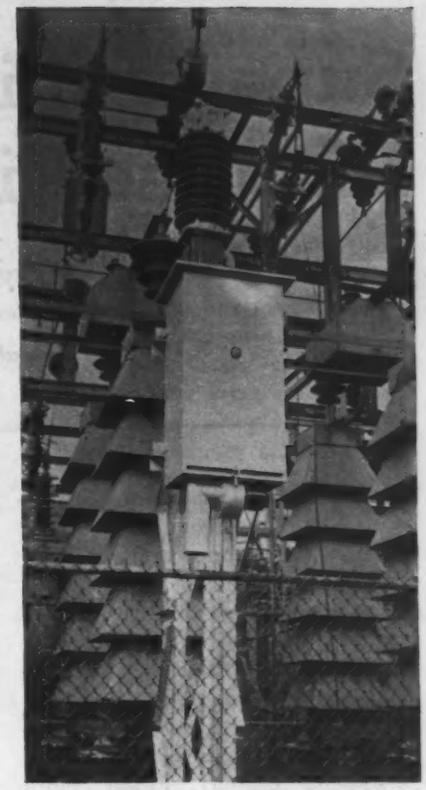
The telephone system is hooked in so that when the receiver of the telephone is removed the pointer of the Metameter receiver drops to the right, closing a switch that automatically cuts the Metameter system out of operation and connects the telephone system. A signaling device is also incorporated in the system. When the dispatcher or attendant at the other end wants to talk he pushes a button on the telephone receiver. When he is through with his message he releases the button and receives the return message.

Telephone communication can be established at any time, automatically taking the carrier away from the telemetering at the end of its signal time, or something less than fifteen seconds. This telephone conversation of course interrupts the telemetering and causes a mark on the chart, but these conversations are very short and the inconvenience is negligible. Accompanying illustrations show the housing of the Metameter at Bellows Falls, the telemeter receiver as installed and a sample chart. The long dashes are caused by the telephone conversations.

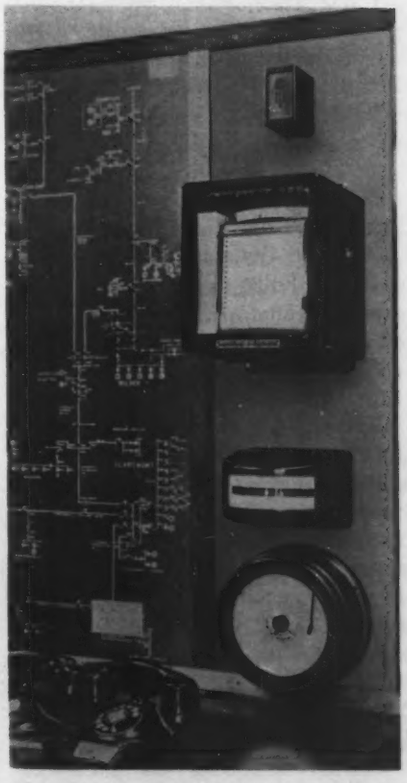
No Bypassing Necessary

This apparatus was installed about two years ago and to date has operated very satisfactorily. There have been a few minor difficulties, mainly small relay contact troubles in the telemeter transmitter and telephone equipment. These were mostly due to

[*Continued on page 46*]



Housing of carrier equipment for Metameter transmitter



Telemeter receiver at Rutland dispatching office

Superposition Experience Discussed in A.S.M.E. Symposium

In two years troubles with high-temperature, high-pressure units and auxiliaries have been diagnosed and largely corrected — Improvement in plant availability performance attained — New co-ordinating equipment devised

IMPROVEMENTS in equipment and in operating procedures have been taking place in connection with four important high-temperature, high-pressure superposed boiler and turbo-generator installations* at Waterside, Fisk, Logan and South Omaha stations. These were reported in four papers by J. C. Falkner (Consolidated Edison), A. E. Grunert (Commonwealth Edison), Philip Sporn (American Gas & Electric Service Corp.) and Louis Elliott (Ebasco Services, Inc.) at the recent A.S.M.E. annual meeting in Philadelphia. High point abstracts of these extensive papers are regrouped here under equipment headings.

Experience Testimony

The papers constitute a comprehensive résumé of mechanical and thermal results obtained in these four stations. Fully as significant as the candid recital of troubles naturally expected with pioneering ventures into higher pressures and temperatures was the assertion by several who presented the papers orally and others who discussed them at the meeting that reliability of these high-pressure installations is now as good as the intermediate pressure installations were at a corresponding stage of their evolution. In fact, several speakers said if they had their present plants to redesign today they would make them basically the same in concept, merely adding the detailed improvements which pioneering experience has shown to be desirable. One said the "growing pains" have been cured and his unit is now "just another unit on the system." Not all the troubles have been minor but the concensus of the discussion was that none have been basic or far-reaching enough to cast a shadow on the valiant adoption of higher pressures.

In fact, the confidence in the program was so substantial that Philip Sporn said, incidental to presenting his paper on Logan, that he hoped to be able to go to 1,000 F. before the life of the turbine is ended. Report was given of intensive study jointly by Westinghouse and Philadelphia Electric of the fundamental dynamic and thermal behavior of first-stage impulse blading which it was hoped would not only throw further light on present blading difficulties but also serve the needs a few years hence "when 2,400-lb. pressures are as commonplace as 1,200 lb. today." E. G. Gailey of Babcock & Wilcox said tersely that circulation and carry-over were well solved, but ash and slag problems still need attack largely because variations in non-combustible content of coal are less tractable than variations in feedwater and its treatment.

The abstracts should be viewed in the light of this interpretation gleaned from the meeting.

Blading and Fouling Troubles

Waterside (two 50,000-kw., 1,300-lb. units)—The impulse blading in the Westinghouse unit revealed cracks in the shroud on the first row when two rows were removed on the advice of the manufacturer in September, 1937. In February, 1939, rebabbiting of the bearings in the head-end of the high-pressure turbine and the one near the flexible coupling between main and feed-heating turbine was done after cracks were detected. The following month the coupling brake and the spindle shift caused rubbing and seizing of the high-pressure dummies; a new spindle was necessitated because the seal disks are integral with the spindle. Since June, 1939, the unit has performed satisfactorily except that, due to governor hunting, resort is made to the load-limiting governor.

Beginning in January, 1939, the companion General Electric unit began to lose capacity (42,000 to 36,000 kw.) over a three-month period. Washing with low-pressure steam for six to eight hours (at 15-20 lb. and 215-220 F.) restored the capacity. It has since been washed again to remove fouling. Washing out of lower waterwall headers and mud drums every two weeks seems to have corrected the trouble. The Westinghouse unit has shown no fouling.

Dummy slots in quadrature with coil slots on the two-pole field stopped vibration at the generator end of the Westinghouse unit. The Westinghouse unit in the short time since initiation of hydrogen cooling uses 10 cu.ft. per day; the General Electric unit uses 30 cu.ft. on the average. Neither cooling system has given trouble.

Availability on the Westinghouse unit has been 74.8 per cent (since September 10, 1937) and 94.2 on the General Electric unit (since June 29, 1938).

Fisk Street (30,000 kw., 1,200-lb., 900 F.)—The Allis-Chalmers turbo-generator unit has had availability factors of 85.7 per cent (three months

*Described in previous issues of Electrical World:

Waterside—"Modernizing New York's Waterside Station," by H. D. Braley, September 25, 1937, pages 1018–1022.

Fisk—"The Rebirth of Fisk Station," by Harry B. Gear, November 19, 1938, pages 1452–1454.

Logan (1)—"Logan Steam Plant—A Landmark," by Philip Sporn, April 11, 1936, pages 1017–1019, (2)—"Logan Uses Hydrogen-Cooled Unit," by L. W. W. Morrow, August 29, 1936, pages 2652–2653.

South Omaha—"Utility Supplies Steam-Electric Service to Packers," March 11, 1939, pages 708–709.

1937), 90.7 (for 1938) and 100 (six months 1939). During the interval there were nine outage periods, three of them attributable to the turbine itself. Repairs to spindle blading were made on two occasions. The generator has had a perfect availability record.

Five days' outage in October, 1937, was for adjustment of a throttle-valve bushing and the governing gear. Seals and dummy clearance were adjusted in the same month and on the 27th the second inlet valve stuck from boiler carry-over. First and second admission valves stuck in July, 1938; in this instance the head of a ¾-in. cap screw was lodged between seat and disk of the second inlet valve and the stem packing of the first inlet valve stuck. Later, soft packing in die-formed rings, less in number, was installed; the leak-off was reduced from 225 to 4 lb. per sq.in.

Welded joints in shrouds of initial impulse blading were found cracked and rewelded, two second row blades were replaced. Shrouding of the second row was reduced from a span of six to three blades.

Steam rate showed gradual increase in the spring of 1939, until by May it had become 26.9 lb. per kw.-hr. at 23,000 kw. Auxiliary turbines driving boiler feed pumps also lost capacity through fouling. Washing for 3½ hours at 590 F. brought the steam-sample conductivity to 1,000 micromhos.

On scheduled inspection in July 26 blades in the second impulse spindle row were found broken and four 3½-in. diameter cylinder bolts also broken. The latter were replaced with bolts of Triplex No. 3 bolt steel.

Logan (40,000 kw., 1,250 lb., 925 F.)—Since initial operation in October, 1937 (in 15,638 hours of elapsed time), the high-pressure section of the plant has been available 57.3 per cent and service hours have been 56 per cent. Availability of turbine was 86.4 and of the single high-pressure boiler was 71.8 per cent. Since the last major turbine difficulty was remedied in July, 1938, these availabilities have been, respectively, 81.5, 97.2 and 84.7 per cent.

"During the thirteen-month period the station heat rate of 14,400 B.t.u. per kw.-hr. compares favorably with the design expectations, remembering, of course, that a serious shortage of circulating water in the summer months is an uncontrollable factor on over-all plant economy. Under such conditions the condenser pressure runs as high as 3.4 in. Hg., and the additional large auxiliary power consumption to operate the spray-pond pumps amounts to 8 per cent of full load generation."

With favorable winter condensing conditions and hydrogen cooling as high as 103,000 kw. has been attained, deriving 48,500 kw. of it from the superposed unit. This amounts to an available reserve capacity of 14 per cent over the 90,400 kw. combined nameplate rating of the superposed unit and five low-pressure turbines.

Two major outages of the high-pressure turbine resulted from first-stage shroud band failure. No trouble from this cause has been experienced since July, 1938.

There have been no vibration problems and no noise problem. The hydrogen-cooled generator "has functioned most gratifyingly even under capacity load with the adverse condition of high cooling-water temperature." Purity is easily maintained at 99 to 100 per cent and hydrogen consumption averages less than 40 cu.ft. per day.

South Omaha (10,000 kw., 1,200 lb., 900 F.)—Operating time has been approximately 78 per cent of elapsed time for boiler and turbine; availability of the high-pressure turbine unit alone has been 94 per cent since the February, 1938, overhaul. Boiler availability since the latest overhaul has also been 94 per cent. "Operation of the topping combination has been practically continuous since the early part of this year and reliability is considered substantially on a par with that of the 325-lb. section of the plant."

Blade deposits reduced turbine capacity prior to February, 1938. Fly-ash blasting removed the silica content of the deposit, but this is not believed to be necessary now because steps have been taken to reduce boiler-water concentrations. Tests now indicate no appreciable scaling of blading. Occasional adjustments have reduced vibration to tolerable values.

Excessive high-pressure packing clearances and steam turbulence between first-stage wheel exit and second-stage nozzles rendered water rate initially 2 to 3 per cent high at lighter loads. A baffle in the first-stage shell space permitted turbine to meet expected performance.

High Pressure Boiler Performance

Waterside (500,000 lb. per hour each)—Both sets of boilers have operated successfully at 1,300 lb. pressure and 450,000 lb. per hour, but it has not been possible to operate at rated load without dissociation of water due (1) to hot tubes in the top boiler-header sections or (2) excessive carry-over. To correct this, changes in baffle and washer designs have been made. New carborundum blocks and refractory are being tried out at the burners. No trouble has been experienced with slag screen tubes, but the chrome ore over them has to be replaced each time the boiler is cleaned. Temperature control of steam (900 F.) by flue-gas bypass around superheater has worked satisfactorily.

Three men per each eight-hour watch are continuously occupied in keeping slag off the boiler and superheater tubes. Soot blowers are used on the economizer tubes with good results. Cleaning of boiler tubes is now done by hand-lancing and by taking the boiler off the line for a few hours twice a week to let the slag on tubes and side walls cool and fall off. A nozzle to use water on the steam-generating tubes is being made up for trial.

Lack of feedwater has shut down the boilers on several occasions. Twice a side waterwall ruptured. Once an automatic valve (controlling feedwater level in drum) stuck; the water tender jammed the valve while endeavoring to transfer to hand operation.

Fisk Station (412,500 lb. per hour, 1,275 lb., 910 F.)—The two steam generators have had average availabilities as follows: 1937, 61.2; 1938, 80.2; 1939 (six months), 87.6 per cent.

When steaming at 230,000-lb rate tests indicated excessive carry-over when total solids in boiler water were maintained at 425 p.p.m. Lowered water level reduced carry-over to 1 p.p.m. but carry-over became excessive again at 310,000 pounds. Satisfactory steam purity has been attained (with total solids at 400 p.p.m.) by changing drum baffle and steam scrubber arrangement.

[*Continued on page 99*]

Heat and Welders Reclaim Salt-Flooded Equipment

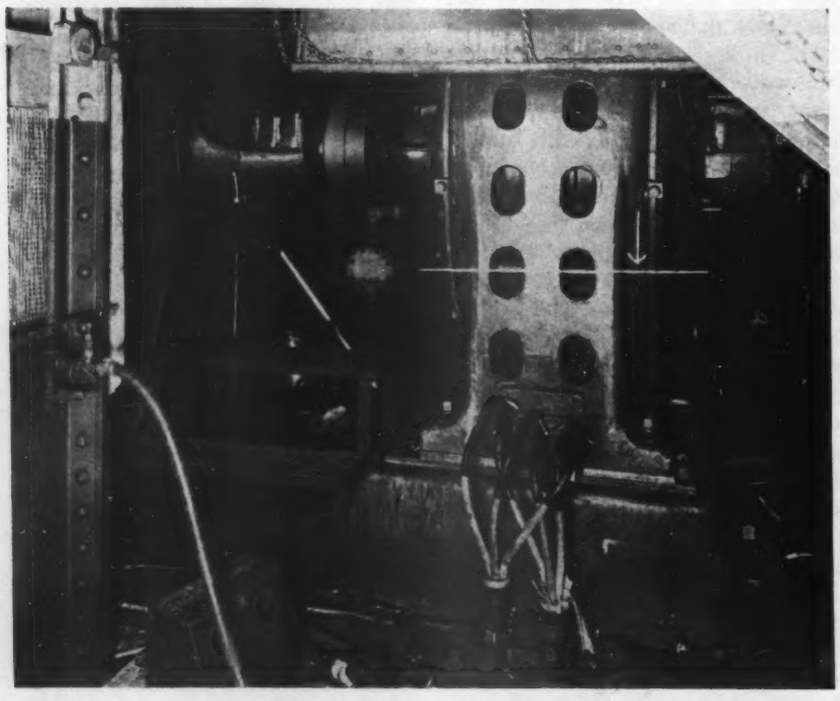
Some Hell Gate equipment rinsed and dried—Welding set generators found very useful for heating current supply—Heat is applied until Megger readings stay constant at satisfactory level.

C. M. GILT, ***Inside Plant Engineer, Consolidated Edison Company of New York, Inc.***

HELL GATE is one of the first power plants of substantial size to be subjected to a salt water flood. Consequently the technique of rehabilitation had to be somewhat more careful in order to assure freedom from subsequent trouble due to deposited and unremoved salt crystals. Rinsing with fresh water, spraying with carbon tetrachloride, heating in an inclosure or rewinding were the principal measures for restoring to service equipment that did not have to be discarded. Service was restored by means of ties during the night of September 21, and by October 3 all units were operating that had been incapacitated by the September 21 hurricane-flood.

Following the hurricane of September 21, 1938, the center of which passed across Long Island approximately 50 miles east of New York City during the afternoon, a backwash of water which has been called a tidal wave rose rapidly during the early evening. This was more than 4 ft. above records of previous high high tide levels and 9.4 ft. above mean high tide levels. The water first entered the station at 8.05 p.m., reached a height of 3.7 ft. above the pump room floor, and was practically off the floor at almost 10:15 p.m. A large pit containing some of the pumps for the two largest generators was below the main pump room floor level and had to be pumped out; likewise, the basement under the frequency changer.

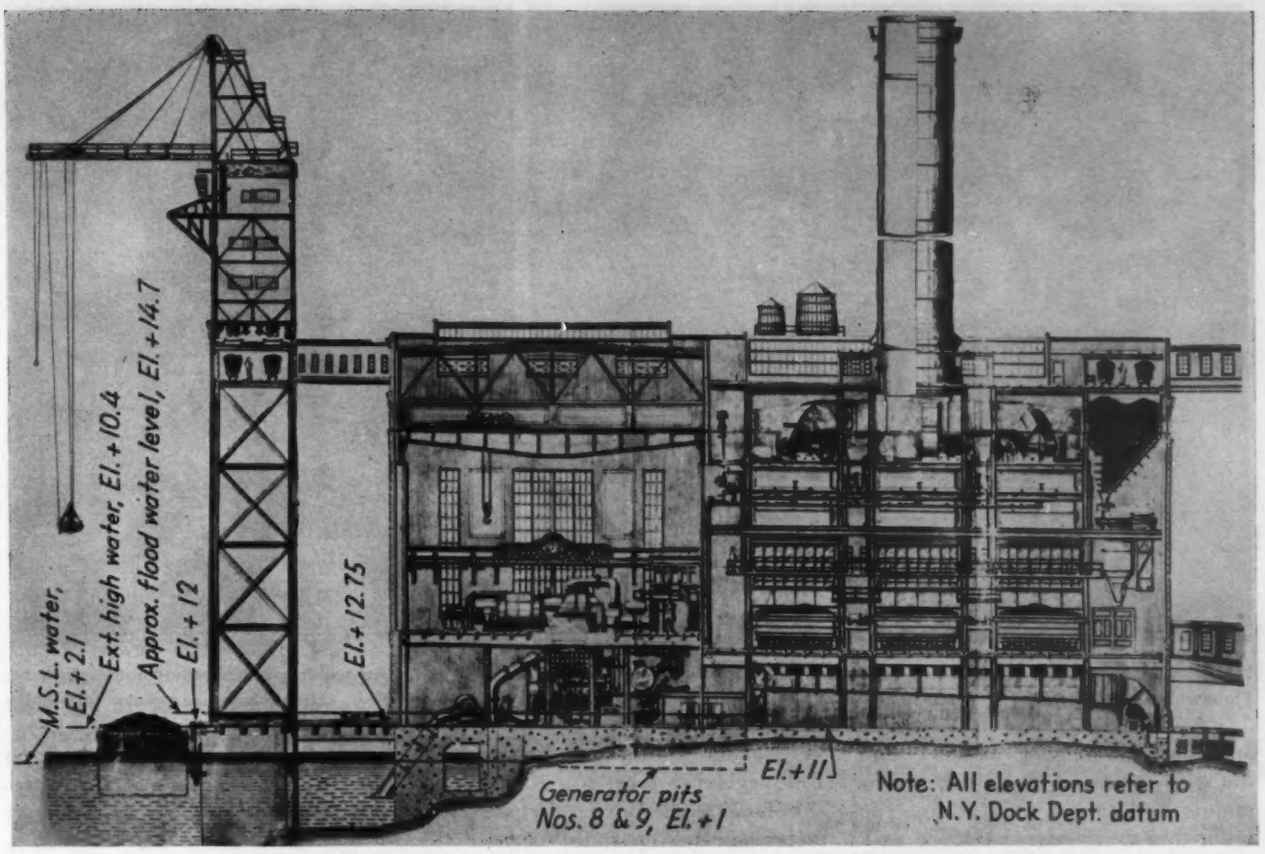
After the water receded it became evident that the 2,300-volt truck boards for auxiliary supply had been seriously damaged by short circuits which burned the buses and a number of the housings. The first step in restoration, therefore, was to tap the 208-volt network mains in the street manholes and bring temporary service into the station for lights, battery charging, small power and drying out purposes. The next step was to cut off sections of the 2,300-volt buses that were burned beyond prompt repair and recondition the trucks and housings that showed the least damage. Good parts were removed from the more seriously damaged trucks to replace parts on other trucks and orders were placed with the manufacturer for parts to replace those damaged. Six trucks were destroyed beyond repair and had to be completely reconstructed.



White line shows salt water flood-tide level on circulator pump motor

Most Motors Submerged

A review of the motor situation showed that the circulator pump motors of the three 25-cycle turbine units were above water, also the forced-draft fan motors for the stoker fire boilers. The latter were a.c. commutator type brush-shifting motors. While the control boards and special transformers for these were wet, it was found possible to connect together the leads from the brushes and operate them as single-speed induction motors until the transformers could be rewound and the controls reconditioned. Otherwise, all the circulator pump motors, hotwell pump motors, boiler feed pump motors, ash sluice pump motors, as well as the


M.S.L. water, El. + 2.1
Ext. high water, El. + 10.4
Approx. flood water level, El. + 14.7
El. + 12
El. + 12.75
El. + 11
Generator pits Nos. 8 & 9, El. + 1
Note: All elevations refer to N.Y. Dock Dept. datum

Hurricane's extra 5.2 ft. of tide flooded motor-driven auxiliaries of Hell Gate's 605,000 kw. of generation

Turbine room basement, containing condensers, and pumps practically at street and dock level. Pulverizers and forced draft fans in boiler room basement at same elevation. Note high water line.

The plant embraces generators as follows: Three 25-cycle, 35,000 kw.; two 60-cycle, 160,000 kw.; two 60-cycle, 50,000 kw.; two 60-cycle, 40,000 kw.; a 35,000-kw. frequency changer.

mill and fan motors for the pulverized fuel boilers, were more or less submerged.

Heater Cabinet Constructed

An existing small room built of steel partitions was fitted up with steam radiators as a drying oven. This was only moderately successful, as the temperature could not be maintained sufficiently high and minute steam leaks kept the humidity higher than desirable. This was supplemented by a room constructed of asbestos lumber and heated electrically. It was possible to maintain the temperature at about 85 deg. C. and provide ventilation to maintain dry air. These drying rooms were used for small motors and equipment. Many of the larger motors and equipment were shipped to the shops of the company or the local shops of two of the principal manufacturers for drying out or rewinding. The largest motors, such as the circulating pump motors, and some of the pulverized fuel mill and blower motors which were difficult to move were dried out in position.

Before drying out, all motors were first washed out with fresh water, blown out with air and then sprayed with carbon tetrachloride. Where practicable, the rotors were removed before washing. The rotors of the circulating pump motors were difficult to remove, and as these were only partially submerged, they were washed out with a hose without removing the rotors. The motors which were dried out locally were covered with tarpaulins, with small openings left at the top and bottom for air circulation. Very successful use was made of portable arc-welding motor-generator sets for applying heat to the windings. The welders were connected to the motor windings without opening the Y or delta, and while this gave an unbalance of current, the temperatures were fairly uniform, and to improve conditions the connections were periodically changed so that each winding carried the high current during part of the period. Approximately full load direct current in the heaviest loaded winding gave good temperature conditions.

Strip or space heaters were used in addition in the bases of the larger motors to reduce the temperature difference between the top and bottom of the motors. Thermometers were used extensively in maintaining proper temperatures. A temperature of approximately 85 deg. C. was maintained in the ovens or on the windings except that the temperature of the oven in which some motors with class B insulation was raised to 125 deg. C. for part of the drying process.

Constancy the Criterion

All equipment was dried out for at least 24 hours and periodic "Megger" readings were taken. Serviceability was determined by constancy of "Megger" readings rather than definite values. Four hours of constant readings were considered satisfactory for small pieces, with eight to twelve hours for the larger motors. Some of these required several days to more than a week to be adequately dried out. A high potential test of 2,300 volts to ground was put on all 2,300-volt equipment before putting back in service, but, in spite of good

Truck switch equipment rehabilitated in operating aisle. Floodwater reached level of white line.

Arc-welding motor-generator set dries out circulating pump motor in position

and constant "Megger" readings and the high potential test used, a few motors broke down on starting. The failures in every case developed as a turn-to-turn short circuit in the end windings, and in no case was there a failure to ground in the slots.

Examination of some of the windings that were removed showed traces of salt and corrosion after drying out. The uncertainty as to how long motors that had been submerged in salt water would last, and the fact that the winter's peak season was close at hand when an epidemic of motor failures would prove embarrassing, led to the decision to rewind practically all the 2,300-volt motors that had been submerged, even though they had been dried out and returned to service. The more essential lower voltage motors were also rewound.

The 2,300-volt cables that were submerged were meggered and given a 2,300-volt high potential test before returning to service. Some cables were put in service that meggered as low as 1 megohm. A fair portion of the varnished cambric cable, even though leaded, had to be replaced before it could be returned to service. In some cases water ran out of the ends of leaded cable when it was pulled out and laid on the floor. Eventually all varnished cambric cable, whether leaded or not, was replaced if its ends had been under water. Rubber and lead cable has not been replaced, even though the ends were under water, if it "meggered" 100 megohms or better.

Following the advice of manufacturers and the reports of experiences of those who had previously had flood experience, current and potential transformers that had been flooded were replaced. The air-cooled transformers for the a.c. brush-shifting motors on the forced-draft fans were all rewound. Some of the air-cooled starting compensators were submerged and were rewound. Grid type resistors, such as are used in the rotors of slip-ring motors, had to be torn down, the contacts thoroughly cleaned, and reassembled with new mica tubes and separators. Very thorough cleaning of the contacts was essential as resistance values of many times the designed values were experienced.

Replace Breaker Tank Liners

Circuit breakers were thoroughly washed out and the tank liners washed and dried in an oven. The tank liners were later replaced, as it was found that some of them warped after putting back in the oil-filled tanks, and it was feared that the salt which penetrated the liners might later contaminate the oil and cause trouble.

Water reached the frames of the frequency-changer set, but did not come in contact with the core or windings. However, the windings showed rather low "Megger" readings and electric space heaters were placed under the frames as well as the air blast transformer in the rotor circuit of the induction motor end. Heat was supplied for several days before the megger readings became constant.

A central co-ordinating and dispatching office was set up in the station as soon as the magnitude of the job was appreciated. This was essential to insure that all necessary steps were completed, to avoid duplication, to keep track of equipment moved about, to place orders with manufacturers, and especially to prevent accidents by centralizing all "hold off" routine. Work was carried on 24 hours a day, with the regular construction and operating forces supplemented by men from various parts of the company, many of whom had little or no previous personal repair or construction experience. Many manufacturers' men were present as armature winders and repair men.

A major repair job such as the one undertaken well emphasized the need for drawings and diagrams which are kept up to date and correct physically as well as electrically. Furthermore, rather complete labeling of equipment is of great help. Great credit must be given to the forces temporarily assembled for this job as well as the men regularly assigned to construction, maintenance and operating work and to the manufacturers who furnished men as well as material on a rush emergency basis.

Complete Customer Coverage Sells Lamps to 51 per Cent

"Three-Step" program sells Pin-It-Up lamps to 58.5 per cent of customers, I.E.S. lamps to 5.64 per cent and Mazda bulbs to 65.2 per cent by carrying sales message to all customers

D. B. HYER, Jr., *Sales Manager, Georgia Power & Light Company*

PRIOR to the fall of 1938 the Georgia Power & Light Company had conducted domestic light-conditioning campaigns with comparative success. An I.E.S. lamp and Mazda carton employee sales campaign in 1937 had produced what was considered excellent sales results. A review, however, of these results revealed an illuminating fact. Sales of I.E.S. lamps per meter were good and in line with expected results, but *the number of domestic customers sold* was a lamentably small percentage of the total system domestic customers.

In the spring of the year an affiliate company, the Florida Power Corporation, had effectively demonstrated in a campaign directed entirely toward maximum customer coverage that a low-cost Pin-It-Up lamp could be sold to at least 35 per cent of the domestic customers. With its experience to guide us, fewer customers per employee (8,154 domestic customers and 129 employees) to be contacted and much less past selling effort behind us, it seemed that we might well be able to secure an even greater coverage; if so, we could visualize very gratifying results. With these thoughts uppermost, the next step was to plan a program of sufficiently definite design so that every employee would know exactly what part he was to play and how to go about it.

A Pin-It-Up lamp, with special shade, was purchased in sufficient quantities to permit the retail price of $1.50, including the 100-watt lamp. To facilitate matters an arrangement was made with the supplier to include the Mazda lamp in the carton package containing the Pin-It-Up unit. An approximate break-down of the selling cost of the unit was:

Cost of lamp, f.o.b. factory	0.87
Freight	0.05
100 watt lamp	0.09
Employee's selling commission	0.25
Advertising	0.07
Sales meetings, prizes, etc.	0.15
Total	$1.48

While this cost break-down predicated no merchandise profit, all selling costs were adequately covered and a limited reserve set up for breakage and repossessions.

Starting on October 1, the story of the sales possibilities of the job to be done and of the three-step plan set up were given to all employees at meetings held in each district. As the first step in the program, every employee was asked to sell, from October 1 to December 24, Pin-It-Up lamps to as many domestic customers as possible. He was also told that beginning November 1, as a second step, he would be called on to sell I.E.S. lamps as well, and on December 1 the Mazda lamp carton, or third phase of the activity, would be added to the picture. At these meetings not only was the utmost importance of the job stressed in detail but the necessity of every employee contacting his quota of approximately 60 customers was shown.

As a further possible sales stimulant the lamps were sold on a no-down-payment basis with no carrying charges; that is, 50 cents per month for three months for each unit purchased. Final results substantiated this method when a check revealed that less than one-half of 1 per cent of the total units sold were not paid for, whereas, undoubtedly, the no-down-payment feature added considerably to the volume of sales.

The introduction of the I.E.S. lamps at the start of the second month of the activity not only did nothing to detract from Pin-It-Up sales but, as a matter of fact, actually increased them. Selling the two units gave an employee the opportunity to sell either; that is, in many instances, while unable to sell the more expensive I.E.S. unit, he found it quite

[*Continued on page 96*]

Results of "Three-Step" Program

Number of domestic customers	8,154
Pin-It-Up Lamps	
Lamps sold†	4,767
Customers who bought (50.8 per cent of total)	4,143
Sales per employee (average)	37
Sales per 100 customers	58.5
I.E.S. Lamps	
Lamps sold	457
Sales per employee (average)	3.5
Sales per 100 customers	5.64
Mazda Lamps	
Bulbs sold (total)	*17,531
Sales per 100 customers (total)	*16
Domestic customers who bought (17.2 per cent of total)	1,406
Average wattage sold to domestic customers	65.2
Estimated Annual Revenue	
Pin-It-Up sales	$9,534
I.E.S. sales	$1,371
Mazda lamps	$300
Total E.A.R.	$11,205

† More than one-third sold for cash. Less than 100 repossessed for non-payment.
* Includes sales to 1,793 commercial customers in addition to the 8,154 domestic.

Outstanding Employee Sales Records

	Pin-It-Up Lamps	I.E.S. Lamps	Mazda Lamps
Lineman (J. W. McQuaig)	730	40	340
Plant superintendent (S. F. Fraley)	528	13	1,271
District representative (T. H. Barker)*	365	43	1,500
District representative (N. B. Farrow)*	333	34	1,730

* Mr. Barker sold Pin-It-Up lamps to more than 90 per cent of his 332 customers and Mr. Farrow to more than 85 per cent of his 277. Two other district representatives, R. C. Roberts and E. O. Jones, sold Pin-It-Up lamps to 85 and 68 per cent of their customers, respectively.

Distribution Planning—VI

Checking Transformer and Secondary Conditions

How to record data and make load and voltage calculations on a distribution system to check conditions on transformer-secondary combinations supplying service to residential areas

C. E. ARVIDSON, *Commonwealth & Southern Corporation, Jackson, Mich.*

INVESTIGATIONS of voltage conditions on transformer-secondary combinations are necessary from time to time in order to maintain adequate utilization voltages. These investigations are necessary when new secondary loads are to be added or when customers complain of unsatisfactory voltage conditions. Customer complaints should be avoided if possible by determining the adequacy of existing transformer-secondary combinations at the time the new loads are added or by making periodic investigations of all transformer-secondary combinations.

Load and voltage conditions of residential transformer-secondary combinations can be determined either by actual load and voltage measurements or by calculations. Considerable expense is involved in making actual measurements, since these measurements must usually be made over a long period in order to obtain maximum load or minimum voltage conditions. Residential loads for any portion of a distribution system can be determined quite accurately from the accompanying curves. Secondary voltage calculations made on the basis of these loads should also be reasonably accurate.

The purpose of this article is to discuss methods of recording data and making load and voltage calculations for residential transformer-secondary combinations.

Data to Record

A record of transformer-secondary combinations should be kept in the form of maps drawn to a scale of approximately 200 ft. to the inch. These maps should record as much of the information shown in the following as possible:

1. Transformer identification numbers, ratings, locations and primary phase to which they are connected.

2. Secondary layout indicating conductor sizes.

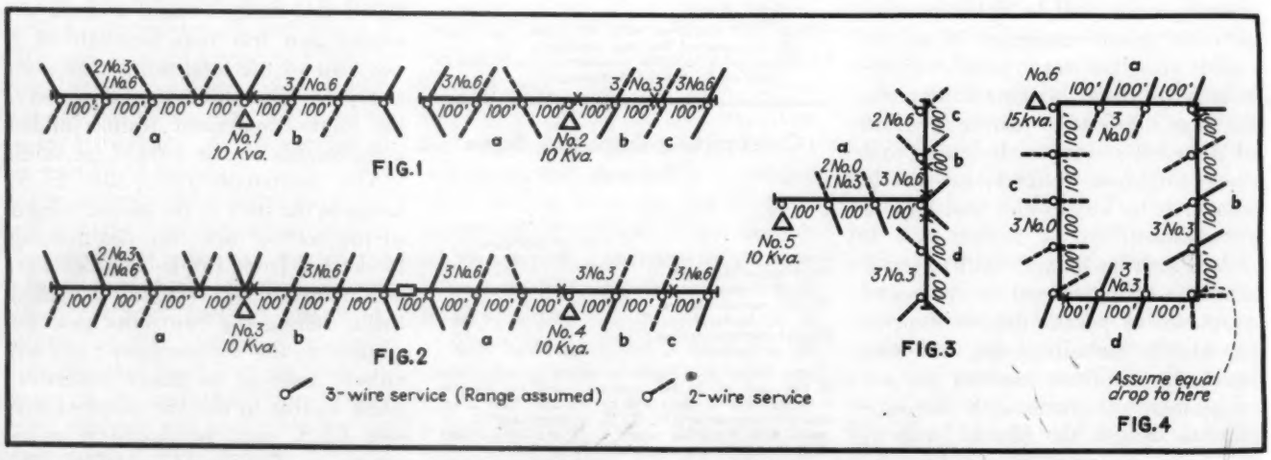
3. Location of secondary fuses if secondaries are banked.

4. Location of two- and three-wire services indicating those which serve range and water heater loads and the occasional commercial customers.

Maps of comparatively large areas are advisable in order to simplify the analysis of transformer-secondary combinations and to determine what steps should be taken to correct unsatisfactory load or voltage conditions. Record maps of individual transformer-secondary combinations are not generally satisfactory, since it is usually necessary to give consideration to adjacent combinations when attempting to correct unsatisfactory conditions in a certain combination.

Secondary Calculations

A simple method of making secondary voltage calculations which



Figs. 1-4—Sample layouts for transformer-secondary combinations in residential distribution systems

should produce results which are sufficiently accurate for all practical purposes is given in Form 166. An explanation of this form follows:

Column

1 Copy the transformer number as given on the secondary map.

2 Designate alphabetically the various sections or branches of the secondary as indicated in Figs. 1–4 inclusive.

3 Indicate conductor size for each section, specifically noting any section which is a two-wire secondary.

4, 5 The number of customers listed in this column is for the purpose of determining the average load per customer and should, therefore, include the total number of customers (including ranges) and the total number of ranges served *from or over* each section. In the case of banked secondaries, indicate for each section the total number of customers and ranges between the banked transformers in order to take advantage of the diversity between the loads on the banked secondaries.

6, 7 Use the curves to determine the average load per customer for the number of customers listed in columns 4 and 5.

8, 9 The figures in this column are equal to the sum of the individual customer distances in hundreds of feet as measured from the beginning of each section. All customers beyond a particular section (but not beyond point of banking) should be considered as being at the end of the particular section in determining the customer distances.

10,11,12 These columns should indicate the product of the average load per customer (lighting or range) and the hundreds of customer feet (lighting or range).

13 This is a constant to be obtained from the bottom of Form 166 for the conductor size listed for the section.

14 The per cent voltage drop per section equals the hundreds of kva. feet times the constant *K*.

15 The total voltage drop can be determined by adding the voltage drop for the various sections of any branch of the secondary.

Form 166 and the load curves are for systems serving off-peak water heaters. Off-peak water heaters do not need to be considered in making transformer-secondary voltage calculations unless the undiversified water heater demand per transformer exceeds the diversified range demand. For systems serving on-peak or combination on-peak and off-peak water heaters a special form and a special load curve should be prepared to fit the load characteristics of the type of water heater in general use.

FORM 166 — OVERHEAD DISTRIBUTION SYSTEM — SHEET 2

DETAILED SECONDARY CALCULATIONS — DATE 1-27-38

Sample (COMPANY) — MADE BY L.A.K.

DIVISION Sample — CIRCUIT Sample

TRANSFORMER NO.	SECTION	WIRE SIZE	NUMBER OF CUSTOMERS LTG.	NUMBER OF CUSTOMERS RANGES	AVERAGE LOAD PER CUSTOMER KVA LTG.	AVERAGE LOAD PER CUSTOMER KVA RANGES	HUNDREDS OF CUSTOMER-FT. LTG.	HUNDREDS OF CUSTOMER-FT. RANGES	HUNDREDS OF KVA-FT. LTG.	HUNDREDS OF KVA-FT. RANGES	HUNDREDS OF KVA-FT. TOTAL	K	VOLTAGE DROP % SECTION	VOLTAGE DROP % MAX.
1	a	#3	8	3	.32	2.4	20	10	6.4	24.0	30.4	.09	2.7	
	b	#6	6	2	.36	3.0	12	6	4.3	18.0	22.3	.16	3.6	3.6
2	a	#6	6	2	.36	3.0	12	6	4.3	18.0	22.3	.16	3.6	3.6
	b	#3	6	3	.36	2.4	10	5	3.6	12.0	15.6	.09	1.4	
	c	#6	2	2	.50	3.0	2	2	1.0	6.0	7.0	.16	1.1	
3	a	#3	8	3	.32	2.4	20	10	6.4	24.0	30.4	.09	2.7	2.7
	b	#6	(12)*	(4)*	.28	2.0	12	6	3.4	12.0	15.4	.16	2.5	
4	a	#6	(12)*	(4)*	.28	2.0	12	6	3.4	12.0	15.4	.16	2.5	2.5
	b	#3	6	3	.36	2.4	10	5	3.6	12.0	15.6	.09	1.4	
	c	#6	2	2	.50	3.0	2	2	1.0	6.0	7.0	.16	1.1	
5	a	#0	14	7	.27	1.5	36	18	9.7	27.0	36.7	.05	1.8	
	b	#6	4	-	.41	-	4	-	1.6	-	1.6	.16	.3	
	c	2-#6	2	-	.50	-	2	-	1.0	-	1.0	.64	.6	a+d
	d	#3	4	3	.41	2.4	6	5	2.5	12.0	14.5	.09	1.3	3.1
6	a	#0	(26)*	(11)*	.24	1.3	30	18	7.2	23.4	30.6	.05	1.5	a+d
	b	#3	(26)*	(11)*	.24	1.3	12	8	2.9	10.4	13.3	.09	1.2	2.7
	c	#0	(26)*	(11)*	.24	1.3	44	16	10.6	20.8	31.4	.05	1.6	
	d	#3	(26)*	(11)*	.24	1.3	12	4	2.9	5.2	8.1	.09	.7	

*These figures include the total number of customers on the banked secondaries between transformers.

VALUES OF K FOR 2-WIRE SECONDARY (FOR 3-WIRE SECONDARIES MULTIPLY CONSTANTS BY 4)

NO. 6	NO. 4	NO. 3	NO. 2	NO. 0
.16	.11	.09	.07	.05

FORM 148 — OVERHEAD DISTRIBUTION SYSTEM — SHEET 1

TRANSFORMER-SECONDARY DATA & CALCULATIONS — DATE 1-27-38

Sample (COMPANY) — MADE BY L.A.K.

DIVISION Sample — CIRCUIT Sample

CALCULATED PRIMARY VOLTAGE DROP ____%. PERMISSIBLE TRANSFORMER - SECONDARY VOLTAGE DROP ____%

TRANSFORMER NO.	TRANSFORMER DATA & CALCULATIONS: RATING KVA	RATING REG.*	NUMBER OF CUSTOMERS LTG.	NUMBER OF CUSTOMERS RANGES	ON PEAK W. H.	KVA LOAD	% LOAD	VOLTAGE DROP %	MAXIMUM SECONDARY VOLTAGE DROP %	TOTAL TRANSF.-SECONDARY VOLTAGE DROP %	REMARKS
1	10	2.75	16	7	-	15.0	150	4.1	3.6	7.7	
2	10	2.75	12	5		12.4	124	3.4	3.6	7.0	
3	10	2.75	16	7		15.0	150	4.1	2.7	6.8	
4	10	2.75	12	5		12.4	124	3.4	2.5	5.9	
5	10	2.75	14	7		14.3	143	3.9	3.1	7.0	
6	15	2.75	26	11		20.5	136	3.8	2.7	6.5	

* USE ACTUAL VALUES OF % TRANSFORMER REGULATION IF AVAILABLE; OTHERWISE USE AVERAGE VALUES OF 2.75% FOR 2400 AND 4800 VOLT TRANSFORMERS AND 3.7% FOR 7200 VOLT TRANSFORMERS.

Transformer-Secondary Data and Calculations

A form (148) has been prepared for recording transformer data and calculations, in addition to providing space for recording the maximum secondary drop and total transformer-secondary drop. This sheet will serve as a summary sheet for transformer-secondary calculations. The column headed "Per Cent Regulation" under "Transformer Ratings" should record the actual rated per cent regulation for the transformer at 100 per cent load and 95 per cent power factor. In case the rated values are not available, an average value of 2.75 per cent should be used for 2,400- and 4,800-volt transformers and 3.7 per cent for 6,900- and 7,200-volt transformers. The columns under "Number of Customers" should record the actual number of customers connected to the transformers (assuming banking fuses open). The

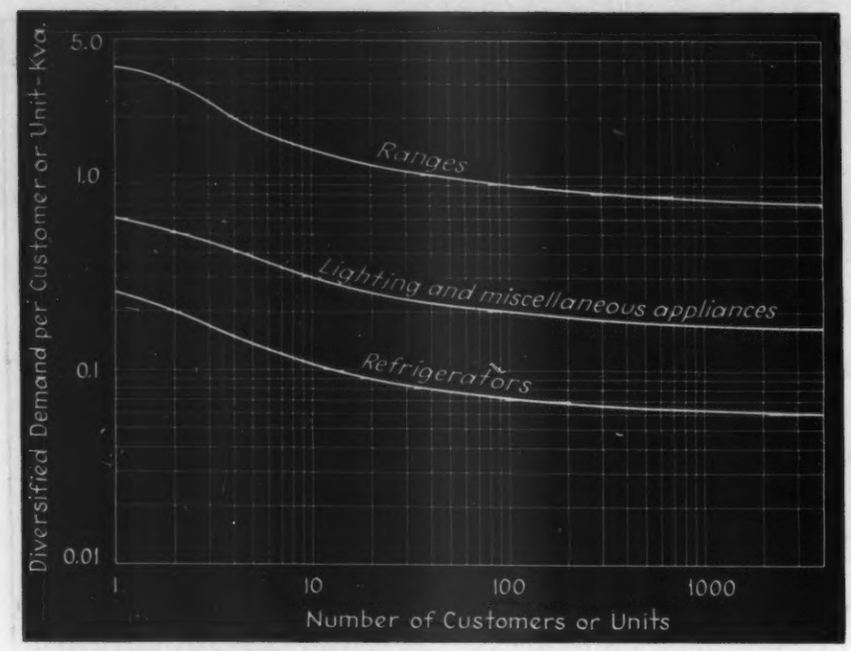


Fig. 5—Curves for determining the residential loads on any part of a distribution system

Note: Multiply values from curves by the following percentages (hourly variation factors) to obtain the total diversified demand for urban systems:

Lighting and miscellaneous	**90 per cent**
Refrigerator	**91 per cent**
Ranges	**100 per cent**

Example—Probable peak demand for 30 customers:

		Kva.
30 lighting customers	30 x 0.23 x 0.90	6.2
15 refrigerators	15 x 0.096 x 0.91	1.3
10 ranges	10 x 1.35 x 1.00	13.5
Probable demand at time of circuit peak		21.0

Demands for entire circuit or for any portion can be worked out similarly.

maximum secondary voltage drop should be copied from the Detailed Secondary Calculation sheet. The total transformer-secondary voltage drop is equal to the sum of the transformer drop and the maximum secondary drop.

A Few Examples

A few sample calculations are included which have been made up for several transformer-secondary combinations as shown in Figs. 1–4 inclusive. The transformer-secondary combination No. 1, Fig. 1, includes the simplest form of secondary. Transformer-secondary combination No. 2 of Fig. 1 also includes a sample form of secondary, except that it includes a change in conductor size to indicate the proper designation of sections and to point out that the hundreds of lighting customer feet for section (b) is equal to four customers times two (hundred feet) plus two customers times one (hundred feet), totaling ten (hundred) customer feet. Attention is also called to the fact that the average loads used for determining the voltage drop on section (b) are based upon the total number of customers on section (b) and (c), while the average loads for determining the voltage drop in section (c) are based upon the two customers at the end of this section.

Transformer combinations No. 3 and No. 4 of Fig. 2 are identical with transformer combinations No. 1 and No. 2 in Fig. 1 except that the secondaries between the two transformers are banked at the point indicated by a fuse. It should be noted from the sample calculations that the average loads per customer used in determining the voltage drops on section (b) of transformer-secondary combination No. 3 and section (a) of transformer-secondary combination No. 4 are based upon the total number of customers on the secondary between the two banked transformers.

Transformer combination No. 5, as shown in Fig. 3, was included in order to show how the load concentration at the end of section (a) affects the hundreds of customer feet and also to indicate the effect of a two-wire secondary.

It will be necessary occasionally to determine voltage conditions on very complicated secondary systems which have been banked so as to form somewhat of a network. It is very difficult to determine accurately the voltage drop in these circuits. They can, however, be approximated by assuming points of equal voltage drop. This can be done in a manner similar to the calculations shown under transformer combination No. 6, Fig. 4, in which the point of equal voltage drop was approximated by trial. In such a case the average load per customer used for the purpose of determining the voltage drops in the various sections should be based upon the total number of customers on the looped secondary. The voltage drops for the two sections were calculated to be 2.7 per cent and 2.3 per cent, which indicates that the maximum voltage drop for these secondaries would probably be the average of these two figures, or 2.5 per cent.

In extremely complicated secondary layouts it may be necessary to determine voltage conditions by actual measurements.

• Last of a series of six articles on the technique of distribution design and analysis. Reprints of the six articles, collected in a stiff cover binding, will be available shortly. Edition will be limited and orders should be sent in early.

Carrier Telemetering Simplifies Dispatching

[*Continued from page 37*]

overloading and have been readily corrected. Some question might be raised about the clutches in the receiver, but there has been no trouble with these clutches as they are cork-faced to a metal disk and are very positive in their action. The indication is accurate. The delays caused by troubles of minor nature have been short, due to being able to locate quickly the difficulty at one station or the other.

In some carrier installations it has been found necessary to bypass individual switches or whole switching stations. In this instance no bypasses have been required, since enough induced signal to operate this apparatus is received even with some sections of the circuit between Bellows Falls and Cavendish out of service. This is true in spite of the fact that the two Bellows Falls-Charlestown circuits run parallel only for a short distance.

In general, this apparatus has been the answer that was sought for the particular requirements.

Measurement of Motor Vibration

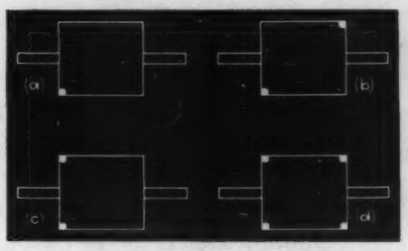
Co-operation of manufacturers through N.E.M.A. in standardizing method of measuring motor vibration has made for improved product — Solder applied as corrective for dynamic unbalance

W. R. HOUGH, ***Experimental Engineer Reliance Electric & Engineering Company, Cleveland, Ohio***

A RECENT example of co-operation among motor manufacturers in their mutual desire to improve the quality of their product and to benefit their customers has been their efforts, through the National Electrical Manufacturers Association, to standardize a method to measure vibration.

Standardization of the method is particularly important because readings of motor vibration are not comparable when the mounting on which the motor rests is not stated. Obviously, a motor resting on a steel plate may have a different amplitude of vibration from a motor floating on rubber pads.

Vibration in a motor may be due to either static or dynamic unbalance or both. An armature (or rotor) may be statically balanced with comparative ease by allowing it to rotate of its own accord on "V" edges or rollers and adding weight to the light side until it stands still. Dynamic balance, which shows up only when the motor is running, is more difficult to correct and requires special balancing equipment used by a skilled operator.



Typical arrangement of weights to correct rotor unbalance

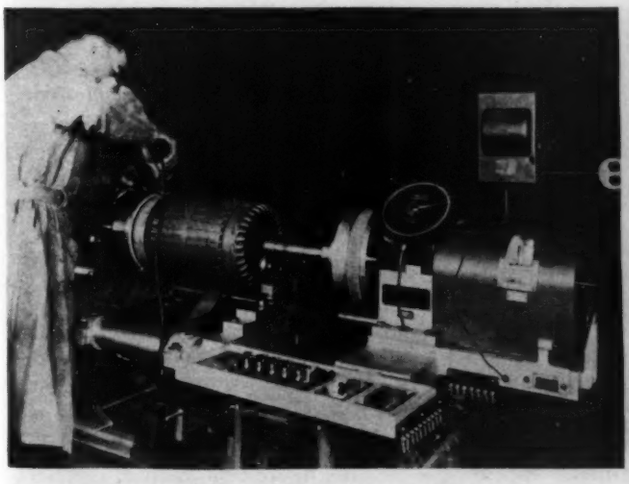
White spot on rotor in (a) represents a weight producing an unbalance. Adding a weight diametrically, (b) or (c), corrects it statically. Correction in (b) is more desirable, since that in (c) introduces a dynamic unbalance which must be corrected by an opposing couple (d).

Dynamic balance involves so many factors that even when a sensitive balancing machine shows a good dynamic balance there still might be some vibration when the armature or rotor is run at its rated speed in the motor frame. For this reason commercial tolerances of unbalance are a practical necessity.

Because dynamic balancing involves couples, the position of original unbalance and correcting weight axially (or laterally across the surface of an armature or rotor) is of the utmost importance. In general, wide rotors and armatures, since they offer more chances for longer couples, require more care to balance than narrow rotors.

The ideal measurement of motor vibration should be made with the motor completely isolated, in order to get the motor vibration alone and

[*Continued on page 104*]

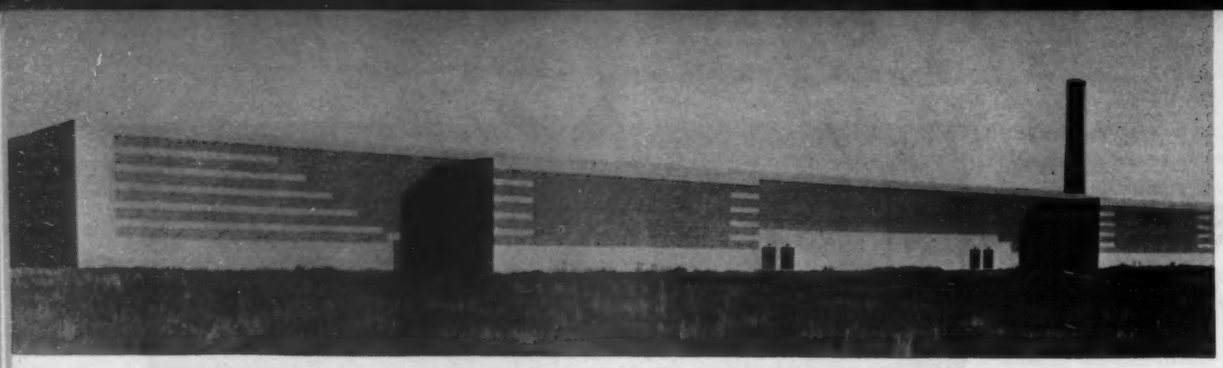


Operator of dynamic balancing machine applying solder to one of armature bands

(Left) Dynamic balancing machine operates on principle of moments and couples. In case of an armature, all weights are calculated to go on the planes of correction afforded by the banding.

(Right) Motor rests on steel platform suspended from tops of four steel columns through four cylindrical rubber supports. Platform is leveled (note level) to distribute weight of motor equally on rubber supports and to level shaft so as not to introduce endwise vibration caused by position of shaft. Davey vibrometer placed on rubber pads to dampen any temporary shop vibration. Vibration readings are taken with full-length half-key in keyway of motor shaft.

Determining amplitude of vibration horizontally at ball-bearing cartridge of motor



Fluorescent Lamps Illuminate Windowless Factory

Air conditioning, sound-proofing and dust removal round out comprehensive provisions — Plant is partitionless despite extensive heat treatment — Push-button control for all equipment — Emergency lighting battery

GIFFORD K. SIMONDS, *Plant Manager Simonds Saw & Steel Company, Fitchburg, Mass.*

SCIENTIFIC superiority of artificially controlled lighting and air actuated the construction of the first windowless factory building by the Simonds Saw & Steel Company. Designed to provide the best possible working conditions for employees, the plant is equipped with completely controlled conditions throughout, including control of air, light, heat, humidity and sound. Because of the spaciousness of the plant, employees report that they are seldom conscious of the fact that the plant is windowless. Secondly, the quality of the new fluorescent lighting employed throughout is such that the plant atmosphere is uniformly cheerful, particularly when the weather outside is gloomy or depressing.

Columns Minimized

Begun in the spring of 1931, the Simonds plant was not completed at that time because of the business depression. This year manufacturing has begun in the new plant. Operations previously carried on in three old plants covering a total area of 17½ acres are now accommodated in this new 5-acre plant, with almost an acre to spare.

The Simonds "controlled-conditions" factory is planned for straight-line production, with the greatest possible number of operating hours. From one to four productive shifts may be used. With normal requirements, two eight-hour shifts are planned, from 7 a.m. to 11 p.m. In this way machinery will be idle only eight hours a day, yet workers will have their normal hours of sleep and their customary recreation.

Inasmuch as machinery in the average plant is ordinarily idle from fourteen to sixteen hours a day, several advantages are obtained from the method of planning at Simonds. The plant and equipment investment is considerably lowered. Machinery, being utilized to the fullest extent, can be depreciated on the basis of wearing out, rather than on the costly basis of obsolescence. Finally, production is increased per man-hour, because of the controlled conditions of lighting, ventilation, heat, humidity and sound.

Special power ducts have been installed on 10-ft. centers throughout the plant, with access openings every 30 inches. Thus, in the event that machinery is to be moved or relocated, extreme flexibility is provided in the wiring. The plant has a connected power load of 6,000 hp. and a total of 4,200 electric outlets, including light, machine power, transformers, switchboard and motor-generators. All power entering the plant is controlled through a 66-ft. main switchboard just inside the west wall, beyond which is the location of the transformer banks and switch houses.

When construction was begun in 1931 an extensive lighting installation was set up consisting of 650-watt industrial lighting units. Mounted on 14 x 20-ft. centers, at a height of 16 ft. from the floor, these units provided an illumination level of about 20-ft.-candles on the working plans. Although this lighting installation was considered completely satisfactory when construction was renewed this year, the recent development of an entirely new type of lighting unit made further investigation seem worth while.

Fluorescent Replaces Incandescent

The remarkable efficiency of a new fluorescent type tubular light source has been widely heralded since its introduction; if these units were adapted to general overhead lighting in the Simonds plant, it seemed quite possible that we would be *economically justified in scrapping an unused installation in favor of the new lamps.*

Lighting specialists were consulted, with the result that we learned that the only fluorescent lamp of sufficient output to adapt it to general overhead illumination seemed to be the 100-watt Cooper-Hewitt fluorescent lamp, made by the General Electric Vapor Lamp Company. Like other fluorescent lamps, this unit consists

of a long glass tube whose inside wall is coated with a fluorescent powder. Activated by ultraviolet radiations generated in the tube, the powder glows with a brilliance which makes for an efficiency far surpassing that of incandescent lamps.

The Cooper-Hewitt fluorescent lamp has an efficiency of 50 lumens per watt, producing a total output of 5,000 lumens. This high output, several times that of equivalent wattage incandescent lamps, adapts the lamp ideally to general plant illumination. The cool blue-white color produced by this lamp provides a cheery atmosphere in the plant at all times, relieving dependence on the vagaries of daylight.

The present installation consists of some 1,500 of these lamps, suspended in pairs at a height of 15 ft. from the floor. Mounted on 14 x 20-ft. centers, the lamps provide a uniform level of illumination of 20 ft.-candles. Flexibility of operation is achieved by wiring two lamps for each outlet.

The factory will have no partitions whatever separating any of the units from one another. Even the office, located in a corner of the building, will be without partitions, with a view to

[*Continued on page 105*]

Although no daylight enters the Simonds plant, newly developed industrial light sources provide a pleasant plant atmosphere no matter what the weather conditions outside. Tubular in shape, these fluorescent lamps are rated at 100 watts, with a light output several times that of incandescent lamps of equal wattage

Some 1,500 of the new 100-watt fluorescent lamps are employed to provide a high degree of seeability and pleasing color characteristics throughout the plant. Employees are seldom conscious of the absence of windows because of the quality of lighting, which produces uniformly cheerful surroundings

Customer Relations Simplified for Medium-Sized Company

Complaints and criticisms received by a specially designated customers' representative — A systematic follow-through pays dividends

E. J. BURGER, *Vice-President and Division Manager Ohio Public Service Company, Lorain*

THERE is no specific problem in the utility business that is more closely related to customer relations than that of servicing complaints. Proper segregation and precise follow-up of customer complaints pay handsome dividends in good customer relations. Loose methods in following complaints can do more harm to a utility's relation with the public than can be offset by hundreds of dollars in advertising. This is particularly true when the utility is merchandising and following an aggressive load-building program. The problem is twofold:

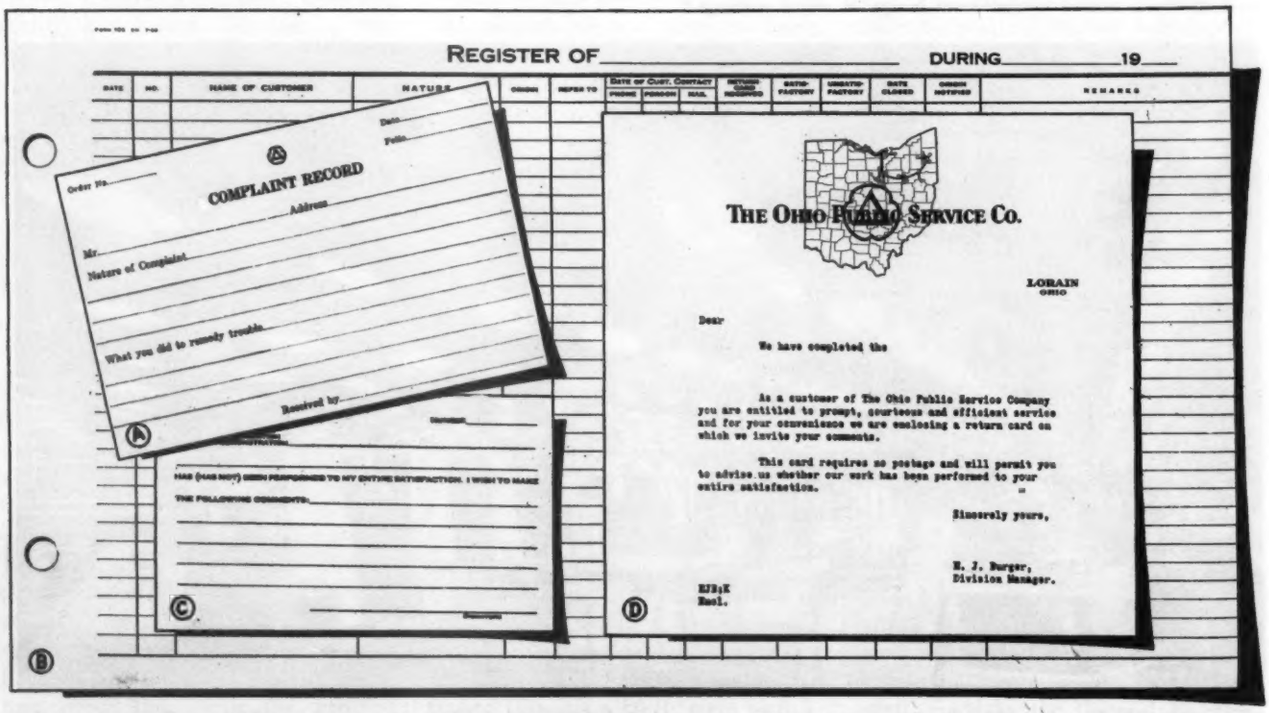
1. To bring all complaints to one single clearing point.

2. To follow them through to a satisfactory conclusion.

Following is a plan that has been in effect for the past three years in a property serving 11,000 customers and has proved extremely satisfactory.

The plan is built around one member of the office personnel titled "Customer Representative." This employee was selected for the position on account of his ability to meet customers well and also understand their viewpoint. His instructions, upon taking over the work, were actually to act as a customer representative in case of complaint and to conduct each investigation impartially. If he found that an employee of the company was in error or that the customer had in any way been unjustly dealt with, he was to follow through until a satisfactory adjustment had been made. The desk and records of the customer representative were placed on the sales floor near the cashier's cage, easily accessible to the public.

Each employee in the property is provided with a complaint record


REGISTER OF
DURING
19
COMPLAINT RECORD
Address
Nature of Complaint
What you did to remedy trouble
Received by
THE OHIO PUBLIC SERVICE CO.
LORAIN
OHIO
Dear
We have completed the
As a customer of The Ohio Public Service Company you are entitled to prompt, courteous and efficient service and for your convenience we are enclosing a return card on which we invite your comments.
This card requires no postage and will permit you to advise us whether our work has been performed to your entire satisfaction.
Sincerely yours,
E. J. Burger,
Division Manager.

Complete set of customer relations forms used by Ohio Public Service
(A) Complaint record, in triplicate, in record book furnished to all employees. (B) Complaint register, used for recording receipt and settlement of complaints. (C) Postpaid return postcard. (D) Letter to customer notifying him of completion, asking for comments.

E. J. Burger

book (see A in illustration). Many complaints are received through this channel and forwarded to the customer representative through foremen and department heads. The original and one copy are received by the customer representative. One copy is retained and one forwarded to the department head of the department under which the complaint is classified, at the same time the complaint is entered on register (B). After the complaint is investigated the form is returned with full information to the customer representative, who then writes the customer a letter (D), asking if the adjustment has been satisfactory, and forwards the completed complaint record form back to the employee after proper entries are made on the register. In the letter to the customer is inclosed a card (C) on which the customer is asked to comment. A surprisingly high percentage of cards are received back from customers. If the card is returned "satisfactory" the investigation is closed on the register; if not, another investigation order is sent out and the investigation is continued.

Similarly, all appliance installation orders, customer service orders, customers' complaints originating from other sources and delay in repair to appliances are all routed over the customer representative's desk, registered and followed in the same manner.

At regular intervals the information received on the return postcard is copied and forwarded to the service department. The information is posted on the service department bulletin board and serves as a guide for the service men.

The plan has received much favorable comment from the public as it has indicated a sincere desire on the part of the company to render a satisfactory service. The operation of an efficient complaint follow-up system is much more important to the utility business than any other business, for the simple reason that the utility business always bears, however unfairly, the stigma of being a monopoly.

Typical Comments from Ohio Public Service Customers

Service on Iron
Comment: Rough spots were not taken off iron.

Service on Frigidaire
Comment: There is a very rasping noise in the motor.

Installation of Radio and Aerial
Comment: Everything is O.K.

Service on Range
Comment: We have no trouble as yet. Will notify you if same shows up.

Service on Range
Comment: The oven has been repaired satisfactory to us.

Service on Thor Washer
Comment: Satisfactory.

Service on Iron
Comment: Smoked a little at first. Was returned and told it was a little oil.

Installation of Range
Comment: O.K.

Service on ear phone and record tester
Comment: Have just recently used the audimeter and it works very well.

Service on Iron
Comment: Dial is very loose and does not work right. When it points to "off," iron heats more than when pointing to cotton or linen. Have already called repair man about it.

Service on Washer
Comment: Letter returned not opened.

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This Matter of Fluorescent Power Factor

WARD HARRISON, *Director of Engineering, Incandescent Lamp Department, General Electric Company*

QUITE RECENTLY announcement was made of the availability of a high power factor tulamp ballast for 36-in. and 48-in. fluorescent "Mazda" lamps. Prior to that the great bulk of equipments sold for lamps of all sizes have been of low power factor —50 to 60 per cent. It is felt that the new twin ballast for the longer lamps will make a radical change in present practice and will largely obsolete the older low power factor equipments. The reasons are:

1. The use of 36-in. and 48-in. lamps in preference to 18-in. and 24-in. lamps now represents 60 per cent of the watts purchased, as against 35 per cent three months ago. This percentage is rapidly increasing, and will continue to do so, because for any given annual operating cost the user can obtain 30 to 40 per cent more light from the longer lamps. The public is rapidly coming to appreciate this fact.

2. The use of the twin ballast with one lagging and one leading circuit practically eliminates cyclic flicker, or stroboscopic effect, so far as the eye is concerned. The flicker of a pair of 48-in. daylight lamps so operated on 60 cycles is no more than the flicker of a 10-watt incandescent lamp on the same circuit.

3. The use of the twin ballast permits one to operate substantially twice as many lamps on branch lighting circuits for a given total amperes as when low power factor equipments are used.

4. The preponderant use of fluorescent lamps is on outlets already wired for 115 to 120 volts. On such circuits twin ballast units of high power factor are more efficient than individual auxiliaries of low power factor and their cost is not materially different. Under the circumstances it is hard to believe that the public will fail to avail themselves of their superiority.

This year the public has spent for fluorescent lighting installations a total of not less than $10,000,000, yet the wattage installed is only of the order of 25,000 kw. out of a total connected lighting load in this country of about 75,000,000 kw., which incandescent lamp load during the same year has increased by an estimated 5,000,000 kw., due in a small way to the construction of new buildings and in a large way to the continued acceptance of higher standards of illumination and higher wattage lamps.

In the face of all these facts, is it not safe to conclude that the effect of fluorescent on the power factor of their distribution systems will shortly cease to be a problem with utility engineers?

Editorials

S. B. WILLIAMS, *Editor*

Responsibility for Rewiring Promotion

THE UTILITIES submitted eight proposals for National Electrical Code revision. Final consideration on changes for the 1940 Code were given last week. All those asking for recognition of bare neutral or covered neutral assemblies lost. Thin wall insulation and greater conduit fill for rewiring were accepted.

This should be looked upon by the utilities as a tremendous victory, for the way is now open for the first time to the rewiring of commercial buildings in a big way. With the new Code, which should be in operation by late summer, a 25 per cent increase in conduit fill with smaller diameter wires will be available to increase commercial building wiring capacity substantially without tearing a building apart.

Utilities have been handicapped in building commercial load by the inadequacy of the wiring and the expense of improving it. Now increased capacity can be provided at a fraction of what it would have previously cost and without any great occupancy disturbance.

Not only will this be a boon to the utilities, but also to manufacturers of commercial current-consuming devices, such as lighting equipment, air conditioning, heating devices.

But, in spite of the advantages, rewiring even at much lower prices will not sell itself. It must be promoted, and in a big way. The utilities asked for a means, and now it is about to be provided. What are they going to do about it? Were they merely looking for some new way to hammer down the price of wiring or were they looking for a new market, a market not only for energy but also for equipment and labor?

A great many times in the past utilities have sponsored or seconded wiring materials or methods which were aimed primarily at lowering wiring costs. Not always have they followed through in an extensive way in the promotion of the new ideas once they received Code recognition.

This is probably one of the greatest opportunities the utilities have ever had to build confidence on the part of labor, inspectors, contractors and manufacturers. If the utilities will promote this new rewiring tool to create a new market they may find that future Code revision proposals will receive much more spontaneous acceptance.

Integration or Disintegration?

A YEAR has gone by since the deadline for filing integration plans under the Holding Company Act. In the meantime SEC has taken unto itself a new chairman and made several changes in the personnel of the utility division. It began to look as though the commission was deliberately stalling because the act could not be administered.

But now it begins to look as though the commission had merely been marking time until it had worked out plans of integration, or perhaps a better name would be disintegration. Now it is ready, but is the industry?

It is no secret that while almost all the holding companies complied with the December 1, 1938, deadline, they presented little that might be classed as plans. They were mostly letters of intention.

The industry was given to expect that in the following months some model plans would be worked out. Instead both sides have been marking time, each apparently waiting for the other to take the initiative. The stumbling block, of course, is who will give up what and who will buy properties detached from a system. On this score SEC now feels that all companies should be brought before it at one time so that there will be no unequal advantage in bargaining for sale and purchase of operating properties to effect geographic integration. That procedure is expected to be undertaken in the near future. Unless the industry is ready to engage in another expensive, long-drawn-out legal battle of uncertain result and poor publicity, it must realize that its best chance for reasonable decision lies in active as opposed to passive cooperation.

The act became law over four years ago and in the meanwhile nothing has been done about the dreaded Section 11. Elections are coming up and this makes good ammunition. Action on the part of Washington therefore can be expected.

The saying that "Life Begins in 40" may have to be revised for the utility holding companies.

Fluorescent Lighting Power Factor

TWO state utility commissions have ruled against the low power factor of fluorescent lighting. Uncorrected installations to 90 per cent power factor will not be permitted in Kentucky, while in Oklahoma uncorrected installations must pay a power factor penalty charge. In California, the only other state commission known to have made any ruling on this point, the utilities have the option of putting in a power factor clause.

Just how serious is this fluorescent power factor problem? The manufacturers tell us that a little more than a million tubes have been produced in the year and a half that fluorescent has been on the market. These lamps are rated at 10 watts per foot, exclusive of accessories. The smallest size is 18 inches and the current trend is toward the 36-inch and 48-inch tubes.

Therefore a 30-watt average will probably err on the right side—making the total wattage for the country approximately 30,000 kw. Since a substantial part of this wattage is corrected, it doesn't seem to be such a large amount when spread all over the country. It will probably be some time, therefore, before the load will be large enough to have any measurable effect on utility distribution. And by that time any number of new developments may have come over the horizon to change the situation in one way or another.

It is possible that some other state commissions may issue orders regulating the installation of fluorescent, but we doubt if the practice becomes widespread, at least until such time as the uncorrected load becomes much greater. Nevertheless, the present rulings should be sufficient evidence to those who are most interested in the welfare of fluorescent that the commissions can and will regulate its installation if necessary. When restrictions are placed upon use the area of opportunity becomes curbed.

At the same time utilities may find that a more effective way of warding off a heavy accumulation of poor factor load lies in the field of trade and customer education. Fluorescent is here to stay and opposition on the part of the power company may be more convincing to a customer than any amount of promotion based on low current cost. The utilities have it in their power to mold this load while it is still young.

Census Resumes Industrial Power Statistics

TO WHAT EXTENT is industry electrically operated? The answer to that question is of particular interest to electrical manufacturers and to producers of energy. For ten years no comprehensive data have been collected, the latest ones being contained in the Census of Manufactures for 1939. This type of information was omitted in the succeeding biennial reports.

At last these data will once more be available. The schedule for the 1939 census, for which field work is to be started in a few weeks, includes power and energy. Manufacturing establishments will be asked to report statistics on the horsepower of prime movers, including steam engines and turbines, internal combustion engines, and hydro-turbines and waterwheels, on horsepower of electric motors driven by purchased energy and those driven by energy generated in the plant. Finally, amounts of energy sold and energy purchased will be reported. This may in some instances call for co-operation by the power company giving service.

From the numerous inquiries that have come to ELECTRICAL WORLD during the past decade it is evident that there is a call for this kind of information. Its omission during the depression years, though apparently necessary, was nevertheless to be regretted. It is fortunate that the Census Bureau has found a way to resume the series.

Grids? We Have the Effects Now

SOME of the statements made with reference to the proposed government "grids" may give the impression that present interconnections are limited and that the interchange of energy is small. This impression is not supported by statistics.

According to the Census of the Electric Light and Power Industry for 1937 the total energy generated by the industry was 121,097,430,896 kw.-hr. In addition 47,202,225,985 kw.-hr. was reported as purchased or received from other sources. The combined total is 168,299,656,881 kw.-hr. Regarding this total the Census report states that "since the energy 'Received from other sources' was, in large part, purchased from other electric light and power companies, a considerable duplication is involved, as such energy would also be included in 'Generated'." (Pages 9, 11.) The amount of this energy purchased from other electric systems is definitely given (page 36) as 32,649,935,135 kw.-hr. Moreover, in the allocation of sales there is an item of 29,859,113,130 kw.-hr. of "sales for resale," of which 27,282,032,158 kw.-hr. constitutes sales to other electric companies. The rest went chiefly to municipals.

Thus there are two items, of the order of 30,000,000,000 kw.-hr., which appear on both sides of the account and approximately balance. The smaller one is equivalent to 22.5 per cent of the total energy generated, the larger one to 27 per cent. A deduction must be made for the small companies that have no generating capacity, buy their energy from other companies and obviously cannot return any. The Census sheds no light on the amount, but it can be shown to be small.

The conclusion follows that the duplication, to which reference is made in this Census report and which represents energy interchanged between companies, was between 22 and 27 per cent of the energy generated. That is what actually happened in an ordinary year, without pressure of emergencies.

How was this interchange distributed as to the nine geographical divisions? For the answer let us turn to pages 30-33 and 36 of the report.

If "sales for resale" are taken as the criterion the percentages range from 15.2 to 49.3. In the Middle Atlantic, West North Central, West South Central, Mountain and Pacific States the interflow was around a fifth to a sixth of the amount generated. It rose to nearly a third in the East North Central and a half in New England.

If "purchased energy" is the criterion it ranged from 16.5 to 51 per cent. In the Middle Atlantic, North Central and South Atlantic states the fraction was about one-fourth; in New England it rose to a half.

For the 145 largest systems, constituting more than 90 per cent of the industry, it is even possible to determine individually the net intercompany purchases and sales, though not the gross. The data are given in the annual supplement to ELECTRICAL WORLD published in May, but there is no need of citing them here. It is evident not only that the various systems are interconnected but also that there actually is a large flow between systems.

New Deal Denies Anti-Utility Drive

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

IN THE very violence of the private denials by New Dealers that any concerted drive against the utilities is forecast by the recent barrage laid down by Lilienthal, Norris, Carmody and Rankin against the electric industry there is a hint of a new type of propaganda. No one among the left wingers indicates a backward step. Far from it.

"I don't believe even the Republicans will dare come out for a flat pledge not to build another hydro plant, or not to aid another single municipal plant in a community where rates are high," said one of them to the writer.

What is bothering the New Dealers most, apparently, is that the electric industry will not go along with the government on a policy closely approximating appeasement—as the word was used after Munich, though of course the left wingers do not use this word.

Rankin in the Way

"Who is scaring the utilities and prospective investors in their securities the more," further demanded this same official, "Lilienthal, Carmody and Norris, or Wendell Willkie? Why, we know plant after plant in this country where it is simply absurd that capacity is not increased, but because Willkie keeps the industry and people who might put their money into it frightened, the improvements are not made."

"Don't you think John Rankin, with his occasional references to the idea that the government ought to take over all privately owned plants and pay 'second-hand junk' values for them might be scaring possible investors even worse than Willkie?" the writer asked.

"Oh, that man," retorted the New Dealer. "I wish to heaven the utilities would really do what Rankin says they are always trying to do—beat him in his own district. We'd be a lot better off if he were out. The public will simply not believe how unimportant he is."

"Rankin is chairman of the public power bloc in the House, isn't he?" said the writer with some surprise.

A sheepish smile appeared on the New Dealer's face.

"Darn him, he even signs his letters that way," he confessed.

It would seem clear, therefore, that the public power crowd is willing to let Rankin's throat be cut if the utility side will just make Willkie stop talking. But it is the end to be thus achieved—leaving out the absurdity of it, and not to mention the fact that not even Roosevelt could gag Rankin, regardless of who might be able to gag Willkie—which is really interesting.

What the New Dealers want is for the private electric industry to start spending—to produce that cycle of better business which Harry Hopkins was so intrigued about when he was first appointed Secretary of Commerce. They want the utility executives to cajole investors to put up their money for improvements and betterments and expansions, and not to worry about public ownership.

On Their Own Terms

They want this despite their frank admission that there not only will be no backward step, but that from time to time they will take a Sudetan strip from the privately owned industry here, and a Danzig there, but of course nothing as big as Finland right in the near future!

Another interesting phase develops amid the denials of a "drive" against the utilities. The New Dealers are growing more sensitive to the charges that their big hydro developments are uneconomic. It is easy to see what has brought this about. With the cordial indorsement of their old standby, Senator Norris, the present notion is to force the government-owned power projects to contribute to the states, counties and towns in which they operate the rough equivalent of the taxes which would be paid to them by privately owned corporations.

Of course this has not been done yet, but it looks more and more likely that the present contributions will be boosted to something approaching a real local tax level. No one has suggested that the government-owned projects ought also to pay to the federal treasury what the privately owned corporations they supplant would pay in corporation income taxes, not to mention the personal income taxes which security holders in the corporations would be obliged to pay Uncle Sam.

Taxes Would Boost Rates

But even this partial change would alter the economic picture, especially as the last thing the public power group wants is to boost its rates to cover these contributions in lieu of taxes. They want them taken right out of the federal treasury.

Even taking it out of the Treasury, however, does not help the balance sheet. Anti-public power senators and representatives will have a chance to talk a lot about "subsidies." In fact, there is even some opposition to letting the federal treasury reimburse states, counties and towns for tax losses when the federal government is already spending so much in these "favored" communities.

At any rate it is explained that in the case of John Carmody's attack on the utilities there was no other thought than to keep the price down on the land which the government must acquire for the Santee-Cooper project in South Carolina. Not to keep that price down, it is

[*Continued on page 103*]

NEWS OF THE WEEK

SEC Ready to Proceed on Utility Integration

Commission says action is not a "crackdown" but definite determination to carry out provisions of holding company act—Move will be made against systems without definite plans

E. DALTON WHITE
News Editor

Action against every utility holding company which has not filed a satisfactory definite plan of system integration under the utility act will be instituted by the Securities and Exchange Commission in the near future. While SEC declares this not a "cracking-down" process, yet it is a definite move by the commission to force compliance with the act.

Decision to proceed immediately against those companies which have delayed filing formal plans was reached after months of deliberation. The commission feels that the immobility of the utilities necessitates strong action and the course has been charted. The deadline on integration, as contemplated in the original bill, is near and it is felt that the process should be put into operation without delay.

On Equal Basis

SEC opinion is that no one single company system should be singled out as a "test case" as it might set a precedent which could not be followed when other integration plans are considered. Such a situation might force the company to place on the "auction block" some of its operating properties with unsatisfactory results. By placing the entire industry on the same bargaining basis much could be accomplished in the way of system integration and co-operative negotiations for the sale and purchase of properties at fair prices. This is one motivating force which has caused the SEC to reach the decision to start integration action on an industry-wide basis.

Suggestions have been made to the industry this week that it would be to its advantage to file definite plans before the SEC starts its action. The feeling is that it would eliminate the "crack-down" version and would enable the utilities to demonstrate to the public that it is doing its best to co-operate with the government in meeting the problems created by the utility act. In this way a great deal of public good will and support could be gained.

No Pattern Formulated

On the other hand, some in the industry feel that the SEC has been studying industry-wide integration from confidential and tentative plans of the individual companies already before the commission, and no pattern of integration has been formulated. It is also felt that the SEC is the one to make known to the individual companies its ideas on system integration as interpretation of the act rests with the commission.

The stalemate on integration has weighed heavily on the SEC as it is

READY FOR INTEGRATION—Members of the Securities and Exchange Commission who are soon to proceed on integration of the electric utility industry. Seated (l. to r.)—Edward C. Eicher, Chairman Jerome Frank and Leon Henderson. Standing (l. to r.)—Judge Robert E. Healy and George C. Mathews

JACK CADDIGAN DINED—Two hundred electrical industry men paid tribute to John J. Caddigan, promotion manager Boston Edison Co., on December 5, celebrating his 35th anniversary with the company and his contributions to electrical development in commercial and industry relationships. A roll of silver certificates was presented to him from his friends.

L. to r., head table—J. J. Reddington, Massachusetts Electrical Contractors' Association; J. F. Timilty, Boston Police Commissioner; C. A. Stone, general chairman; Rev. L. F. Kelleher; Mr. Caddigan; Thomas Carens, vice-president Boston Edison; W. A. Reilly, Fire Commissioner, Boston; Leavitt L. Edgar, vice-president Boston Edison; J. B. Casey, director public relations New England Power Association; James J. Caddigan; G. W. McShane, contractor-dealer, Boston; Julius Daniels, merchandising manager, Boston Edison; W. L. Boudrot, chairman entertainment committee, and F. L. Kelley, former acting wire commissioner, Boston.

being pushed by the act deadline and, in recent weeks, there has been some political pressure. Representative John E. Rankin recently suggested to the SEC that it integrate the utilities or "get out."

The suggested formula of integration for a holding company is one "backbone" operating system and any additional utility systems which will meet the A,B,C, requirements of section 11. The major proof of any integration system will be considered in the light of these requirements.

Diversification

The point of "diversification" of investment as against "scatteration" of properties theory holds little weight with the SEC, for the commission maintains it is prepared to show that only in exceptional cases has the "diversification" theory proved successful. Main proof is in the large volume of preferred dividend arrearages of operating companies which has left many holding companies with an even greater problem of ever being able to pay off in full the back dividends which have accumulated on holding company preferred stocks. In this instance the SEC feels that complete reorganization of the capital structure of the holding companies is necessary. The commission points out that unless recapitalization is accomplished there is little hope that holders of common stocks of holding companies will ever receive a return on their investment.

Several definite plans of system integration have been before the commission for more than a year without a final ruling. American Water Works & Electric Co. was the first to get approval to its plan, but the problem was relatively simple when other complicated setups are considered. Columbia Gas & Electric is being held up awaiting court decisions regarding its gas situation. Hearings on the American Gas & Electric plan have been scheduled for January 29, 1940, but in this case an industry pattern is not likely to be set. The "backbone" system is considered sound by the SEC and it is felt that the Scranton and Atlantic City properties have a good chance of meeting the A,B,C, requirements.

Court Battle Looms

While the utilities have some good arguments why they have been waiting for SEC initiation in starting integration, the commission feels that there is a strong reluctance on the part of many companies to "do anything" about it. The industry has never been convinced that it should be forced to sell properties against its wishes. The chances are not remote that a full test of the integration provisions of the utility act and their constitutionality will come before the courts.

Outdoor Steam Units to Be Built in West

Two outdoor steam units, first of their kind in the West, will be in service next year in southern California. While their combined ratings of 30,000 kw. is sizable, that amount is insignificant in comparison to the overstrained capacity of the Los Angeles area in which they are to be installed.

The bigger unit is being furnished to the city of Glendale by General Electric Co. for $405,000. Its rating is 20,000 kw., 13,800 volts. It is hydrogen-cooled, will operate at 725 lb. per sq.in. gage and is to be turned over to the city in place, complete with exciter and pilot exciter, within 390 days of signing the contract last September 11.

Burbank will install the other unit, which is being furnished by Allis-Chalmers Manufacturing Co. for $257,000. Operating at 600 lb., 825 deg. F., 3,600-r.p.m., this unit will deliver 10,000 kw. at 4,500 volts, 80 per cent power factor, and is to be in use in August.

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Municipal Power Plant

Glendale, Calif., has started work on its $1,800,000 municipal steam-generating plant which is expected to be completed by December 1, 1940, to augment the supply the city is receiving from Boulder Dam.

Meter Department Heads Consider Test Devices

Pennsylvania Electric Association committee discusses standardized dials, safety measures, maintenance of demand registers and meter history card system — New devices are disclosed

Several new devices were disclosed to the members of the meter committee of the Pennsylvania Electric Asociation at Altoona last week.

R. E. Keller of Duquesne Light showed a sample of a new bimetallic strip thermal demand attachment for watt-hour meters. He has installed 200 (made by Sangamo) in parallel with conventional demand registers for observation.

F. L. Pavey (Duncan Electric) announced availability of meters with porcelain terminal blocks and sleeves of synthetic material for the terminals. His company is now delivering meters with either Nobelloy pivots or chromium-tungsten balls as desired.

New Cleaning Machine

Ken Markley reported that Eastern Specialty Company has perfected a new cleaning machine developed by Illinois Watch Company for watch cleaning and also is offering a torque tester to check pointer and clutch friction on demand registers, particularly the cumulative type. This was devised in the Philadelphia Electric meter department (ELECTRICAL WORLD, June 17, 1939).

After the first of 1940 the General Electric Company, stated T. A. Abbott, will be able to supply initial quantities of watt-hour meters equipped with Alnico magnets to resist surge effects. Also in production are new demand registers with four cumulative dials. A photo-electric tester built for factory testing is to be made available for utility meter department use; it is more accurate than hand testing and saves much time. The creep holes in the disk pass the actuating beam.

The committee went on record as strongly favoring the avoidance of dial constants on any single-phase meter or polyphase of less than 50 amperes. With some dissent, the vote was also in favor of having five-dial meters available where a four-dial meter would require a constant of 10.

Canvass of the committee showed about equal division in practice between conducting periodic meter tests on a due-date and on a route basis. Discussion of the matter of centralizing meter department activities revealed that the degree of centralization feasible was dependent on the type of company organization.

The non-interchangeable fuse requirements of the pending NEC along with the prospective stipulation that service loops be skinned to prevent seepage into the service entrance conduit were called to the attention of the committee. Pending reports on the detrimental effects of lightning upon meters were discussed, particularly one in preparation by the P.E.A.

W. H. Wade, vice-president of the host company at Altoona and past-president of the P.E.A., gave an illuminating outline of the multifarious activities of the association in protecting the interests of the electric utilities and their personnel. As one typical example he cited the audit made to support their contention that the assessments made by the Pennsylvania P. U. C. for support of basic regulatory activities are inequitable. Fewer rulings are being promulgated without prior hearings.

•

Rate Refund Date Set

Edison Light & Power Co. of York, Pa., has to March 1, 1940, to make refunds to customers under the Public Utility Commission's order of November 30, 1937. The refunds cover a period of December 17, 1937, to May 1, 1939, during which the commission order reducing rates was ineffective by reason of court proceedings instituted by the utility. The commission ordered a temporary rate reduction to save customers $435,000 a year. The Supreme Court upheld the commission's order last April 17.

•

Westinghouse Starts 1940 Line Previews

Opening its 1940 series of distributor-dealer meetings with the theme "Faster for Forty," Westinghouse Electric & Manufacturing Company introduced a preview of its 1940 appliances and sales plans to approximately 300 distributor executives assembled at Mansfield, Ohio, last week from all sections of the United States and from Canada, China, Brazil and Mexico.

One of the biggest years in the history of the merchandising division was predicted by Frank R. Kohnstamm, who announced materially increased advertising appropriations and a new sales training program. The complete 1940 line of refrigerators, ranges, water heaters and other domestic appliances was displayed and Mr. Kohnstamm and other Westinghouse officials described the 1940 program of advertising, promotion and sales training.

The series of meetings will continue for a month, the line being opened to public inspection in New York on January 5, 1940.

DISTRIBUTORS MEET—Foreign representatives seen at the Westinghouse preview included (l. to r.)—L. B. Bourns, Mansfield headquarters; Otto Christoph, of Paul J. Christoph Co., Rio de Janeiro, Brazil; G. W. Bogdanoff, import manager of Melchers, Inc., Tientsin, China; W. D. Cunningham and D. C. Brooks of Westinghouse International Co., and J. A. Cowan, general manager of Cia Distribudora Westinghouse S. A., Mexico City, Mexico

Oklahoma Files Against Giant Denison Project

Questions right of government to construct $54,000,000 power-flood control dam on the Red River without compensation to state—Jackson defends project in brief to Supreme Court

The question whether the federal government has the constitutional right to construct flood control and hydro-electric projects without the express consent of the states involved and without payment of adequate compensation for direct and indirect damages to the state has been brought before the U. S. Supreme Court by the State of Oklahoma as the latest development in the controversy over the $54,000,000 power-flood control Denison (Texas) Dam on the Red River.

The newest angle in the controversy is the filing of a brief in the Supreme Court by Solicitor-General Robert H. Jackson defending Secretary of War Harry H. Woodring against an injunction suit by Oklahoma.

Important Unit

"The Denison Dam and reservoir," the brief stated, "is an important unit in the entire flood-control program and determination of its validity at the earliest possible moment is therefore desirable."

"The United States," the brief stated, "has full power to take property owned by the state in eminent domain proceedings. Nor can a federal project be halted upon the complaint that the functions of the state will be hampered by the flooding of land. There will be no loss of political jurisdiction and the objection is simply that citizens will be forced to move and the tax revenues of the state may be reduced.

"But the very purpose of paying just compensation is to leave whole a dispossessed property owner and it is settled that any diminution of state tax revenues does not affect the validity of federal legislation."

The tax revenue angle is what Oklahoma sees as pinching the purse, much as Tennessee and its municipalities found out in the TVA situation when the Tennessee Electric Power Co. was forced to sell its properties last August.

Oklahoma's Attorney-General Mac Q. Williamson charged that the construction of the Denison Dam constitutes "an unlawful invasion and destruction of the sovereign, territorial and proprietary rights" of the state.

In a sweeping condemnation of the activities of the War Department in prosecuting the work, the complaint states that the government is "without lawful power or authority, under the Flood Control Act of 1938, to take land located within the borders of complainant, including that owned by it, take its highways, rights-of-way therefor and bridges, obliterate its distinguishable boundary, oust its citizens from their homes, hamper and destroy its subdivisions of government and take from complainant its jurisdiction and authority over said property for the construction of said dam and reservoir. . . ."

The state challenges the right of the federal government to undertake the project on a stream which the Supreme Court itself has declared non-navigable within the state of Oklahoma.

Interest was centered in the case because it offered the first complete test of flood control and rivers and harbors legislation under which the federal government is empowered to construct huge hydro-electric projects to compete with private utilities. If the state should win the case future developments of this type would be impossible without the full consent of the states involved.

Governor Phillips has opposed the project and suit was filed at his suggestion.

•

FPC Plans Appeal on New River Case

The Federal Power Commission expects that its appeal from the Circuit Court decision in the New River case will be made to the United States Supreme Court in the near future. Clyde L. Seavey, chairman, stated that the Justice Department and FPC attorneys are now preparing the case.

Arguments of the FPC will stress that while a stream may not be navigable, yet if it flows into a navigable stream the commission has jurisdiction. The Circuit Court at Baltimore, in upholding the lower court decision, ruled that the New River was non-navigable intrastate and that the FPC had no jurisdiction and could not force the Appalachian Electric Power Co. to take out a license for the construction and operation of its $10,000,000 hydro-electric project near Radford, Va.

Mr. Seavey said that the FPC has no arguments with the state of Virginia over recapture of the project at the expiration of the normal 50-year license. He said that the Water Power Act provides that the state can exercise eminent domain.

Because of the FPC jurisdictional question involved in this case it has assumed national importance.

•

Makes Offer to Use Shasta Dam Energy

Co-operation with California's State Water Authority in the marketing of energy when it becomes available at Shasta Dam was offered last week by Pacific Gas & Electric Co. President James B. Black outlined the offer in a letter to Frank W. Clark, director of the state's Department of Public Works. He said the company would enter into a contract to (1) absorb plant capacity up to 400,000 hp. in five years and (2) use Shasta energy for load in excess of that which could be carried by its own hydro plants plus minimum contracted and steam power during the time Shasta energy is being completely absorbed.

Mr. Black said P. G. & E. would pay a rate "equal to what equivalent power would cost the company if obtained from other sources." He expressed the belief that this would exceed the rates at Boulder Dam and at Bonneville.

Pointing out the fact that his company is now distributing power from several public plants, Mr. Black emphasized the proposal is no untried experiment and further wrote:

"We believe this proposal is much more to the advantage of the water and power users, to federal and local taxpayers and to thousands of investors in securities of this company than any other conceivable method of absorption. However, if there are any points of disagreement, we will be pleased to discuss them with you or the Central Valley Authority."

•

"Pole Top" Resuscitation

Georgia Power Co., Columbus, reported on November 11 what was believed the first successful use of "pole top" resuscitation of a lineman in the state who had touched a live wire. Leo West, working on a high line near Columbus, slumped unconscious in the leather sling when his head touched an 11,000-volt wire. C. C. Poynes, a fellow lineman, climbed the pole and applied artificial respiration. After five minutes Mr. West recovered and was able to climb down.

Recent Utility Attacks Denied as New Drive

Denials have been made in every quarter that there was a "conspiracy" on the part of government power agencies in formulating a concerted attack upon the electric utilities as indicated by the closeness of speeches by TVA Director David E. Lilienthal, Federal Works Administrator John M. Carmody, REA Administrator Harry Slattery and the SEC release.

Mr. Carmody said he did not know that Mr. Lilienthal was making a speech at the dedication of a REA project at Lafayette, Ala. He said that his speech had been promised the Santee-Cooper project several months ago and was delivered on a day which had no connection with any other speech or event.

The SEC report, showing utility preferred dividend arrearages, had been in the process of preparation for many months and its release, at the time had no connection with the other events.

While the sequence of events had the appearance of a concerted new attack on the utilities, each was an individual effort without relation to a prepared plan.

•

FPC Denies Application for Holtwood Rehearing

Federal Power Commission has denied the petition of Pennsylvania Water & Power Co. for a rehearing on the commission's order of November 3, which requires the company to file an application for a license for its hydroelectric project on the Susquehanna River at Holtwood, Pa.

At the same time the commission granted a stay of 60 days from December 11, or until 30 days after the final judicial review under Section 313 of the Federal Power Act, for the application of any penalties which might otherwise be imposed under the act for failure to comply with the order of November 3.

The company in its application for a stay and rehearing had maintained that the commission has no authority to require the filing of an application for a federal license.

•

Four Carolina Co-ops Get $400,000 from REA

REA has allotted $100,000 each to four South Carolina co-operatives, each of which is being organized with the co-operation of the State Extension Service. These loans were approved as a result of conferences in Columbia in which members of the REA staff met with state officials, including Gov. Burnet R. Maybank.

While organization of the new co-operatives is not yet complete, results so far indicate that each will have about 125 miles of line and 400 members initially. One will have lines in Berkeley, Dorchester and Charleston counties and headquarters at Monks Corner; another will serve parts of Darlington, Lee and Florence counties and have its office at Darlington; a third will be in Marlboro and Dillon counties with headquarters at Bennettsville, and the fourth will be in Williamsburg and Clarendon counties with headquarters probably at Kingstree.

•

Let Turbine-Condenser Contracts in Ft. Wayne

Ft. Wayne (Ind.) Board of Works has awarded a contract to General Electric Co. for a new turbine at a cost of $323,329 and to the Westinghouse Electric & Manufacturing Co. for a condenser at a cost of $65,250, to be installed at the steam generating plant of the city light and power works. A new boiler now being installed will provide, with others in service, adequate steam for the new 15,000-kw. generator.

It is estimated that with time of fabrication and erection taken into consideration the new equipment will not be in service until early in 1941. Appurtenant equipment for the generator and condenser is to be purchased later by the board.

Oregon REA Co-op Asks Tax Exemption

The current issue of the *Oregon Voter* finds it an astonishing utility development that promoters of the Umatilla Electric Co-operative, an REA project, is seeking tax exemption for the company's properties.

"Now that the Umatilla farmers have quasi-public ownership of power facilities the 'tax shoe' manifestly is on the other foot," it comments. "The old doctrine of 'soak the power utilities,' so long a part of public ownership propaganda, seems to have backfired."

The tax relief appeal is significantly worded, it says, concluding: "The present method of taxing on a valuation determined by cost of construction is practically confiscatory."

•

Crowley to Aid Standard on System Integration

Leo T. Crowley, newly elected board chairman of Standard Gas & Electric Co., will continue for several months to give precedence to his duties as chairman of the Federal Deposit Insurance Corp., it was disclosed this week. Mr. Crowley assumed the utility post on December 8.

It was learned that Mr. Crowley will begin work on system integration when he becomes active with Standard Gas. Much work is to be done in this direction to meet requirements of the holding company act.

FIFTY YEARS—Axel L. Holme (center left), assistant to controller of Consolidated Edison Co. of New York and treasurer of Edison Savings and Loan Association, surrounded by his staff as he celebrated this week 50 years of utility service. E. M. Van Norden, association president, presents testimonial of employees and Edison officials and 50-year emblem

Thin Wall Insulation Gets Code Approval

Thin wall conductor insulation received acceptance for inclusion in the 1940 National Electrical Code at the Atlantic City meeting last week of the Electrical Committee, N.F.P.A. This was one of the eight proposals of the Edison Electric Institute. The revisions also included 25 per cent greater conduit fill for rewiring with thin wall insulation, a new table of higher current-carrying capacities for grades above Code wire and wattage capacity for figuring commercial building branch circuit wiring.

Bare neutral and covered neutral proposals were voted down. Garage wiring restrictions were limited to commercial garages. Wood molding and cast-in raceway provisions were deleted.

Three grades of building wire are now recognized, namely, Code, Performance and Heat Resisting (type RH). In the larger sizes Performance grade has 20 per cent higher carrying-capacity than Code, while Heat Resisting will have a capacity of 20 per cent above Performance. It was believed that the effect will be to eliminate Code grades in the larger sizes because of the additional cost.

Thin wall insulation of 1/32 inch for sizes up to No. 10 and 3/64 for No. 8 was approved for type RH. This grade may be used for both new wiring and rewiring. Latex thin wall insulation of 0.018 inch in Nos. 14, 12 and 10 is restricted to rewiring for increased load where space is not available in raceways for conductors having thicker insulation and where impracticable to increase size of raceway due to structural conditions. Synthetic insulation also was restricted to the same rewiring conditions and, like Latex, to 60-degree temperature limitation, but with the following insulation requirements: Nos. 14 to 10, 2/64; No. 8, 3/64; Nos. 6 to 2, 4/64; Nos. 1 to 4/0, 5/64.

Non-tamperable fuses will not become mandatory until January 1, 1941. Adaptor interchangeability is made a recommendation.

The new conduit fill for rewiring with thin wall insulation is 60 per cent for one wire, 40 per cent for two wires and 50 per cent for three or more wires. This represents approximately a 25 per cent increase.

•

Electric Exhibits Popular

The large electrical exhibits at the New York World's Fair were among the most popular of the industrial exhibits, according to an independent analysis of attendance. The decision of General Electric, Westinghouse, Consolidated Edison of New York, the electric utilities and other electrical exhibitors to participate in the 1940 season assures the public another opportunity to view these highly interesting and educational showings.

•

1940 Shows and Exhibits

The annual schedule of shows and exhibits for 1940, published by the Exhibitors Advisory Council, New York, has been released for general distribution. This 34-page informative booklet contains complete data on 350 American shows, giving the name of the exhibit, date, location, address of sponsor and name of association secretary or show manager. In addition, 57 shows are listed on which dates and locations have not yet been selected.

•

Hartford Hearing Deferred

Hartford Electric Light Co. hearings before the Federal Power Commission, scheduled for December 6, have been postponed until January 8.

MEETINGS

American Engineering Council—Annual meeting, Mayflower Hotel, Washington, D. C., January 11-12.

Public Utilities Advertising Association—Annual western conference, Hotel Cosmoplitan, Denver, Colo., January 12-13. Publicity Committee, P.U.A.A., Room 1704, 4 Irving Place, New York, N. Y.

Louisiana Engineering Society—Annual meeting, St. Charles Hotel, New Orleans, La., January 12-13. A. M. Hill, secretary-treasurer, 422 St. Charles Hotel.

Canadian Electrical Association—Annual winter conference, Montreal, Que., January 15-16. B. C. Fairchild, secretary, 804 Tramways Bldg., Montreal.

American Society of Refrigerating Engineers—Annual meeting, Cleveland, Ohio, January 22-26.

American Institute of Electrical Engineers—Winter convention, New York, N. Y., January 22-26. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

American Society of Heating and Ventilating Engineers—Annual meeting and International Heating and Ventilating Exposition, Lakeside Hall, Cleveland, Ohio, January 22-26. Charles F. Roth, president International Exposition Co., Grand Central Palace, New York.

Iowa Public Utilities Association—Annual sales and distribution school, Hotel Fort Des Moines, Des Moines, Iowa, January 29-30. Herbert Henderson, secretary, Security Building, Cedar Rapids, Iowa.

Edison Electric Institute—Prime movers committee, Detroit, Mich., February 5-6; electrical equipment committee, Netherlands-Plaza Hotel, Cincinnati, Ohio, February 12-13.

National Electrical Manufacturers Association—Mid-winter Conference, Waldorf-Astoria Hotel, New York, N. Y., February 5-9. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

Missouri Association of Public Utilities—Annual convention, Elms Hotel, Excelsior Springs, Mo., April 17-19. Jesse Blythe, assistant secretary, Merchants Bank Bldg., 101 West High St., Jefferson City, Mo.

Electrochemical Society—Spring meeting, Galen Hall, Wernersville, Pa., April 24-27. Dr. Colin G. Fink, secretary, Columbia University, New York, N. Y.

Whiteford Named New Associated Gas Head

Roger J. Whiteford, at one time general counsel of the Federal Housing Administration, was this week elected president, general counsel and director of Associated Gas & Electric to succeed J. I. Mange, who resigned because of ill health.

This is one of the first steps toward a reorganization of the system's management preparatory to the readjustment of its structure, operations and securities to conform to the utility holding company act.

Mr. Whiteford said that it "is his purpose to give attention at once to the simplification of the corporate structure of the system, the integration or consolidation of its properties and operations and adjustment of the voting power of its security holders upon a fair and equitable basis." He said that Associated Gas & Electric will move to seek complete conformity with the utility act.

•

Company Workers Honor Moloney Electric Heads

More than a thousand employees of the Moloney Electric Co. and their wives last week paid tribute to Thomas O. Moloney, chairman, and James J. Mullen, president, in recognition of their inspirational leadership through forty-three years of progress devoted to the perfection of the Moloney transformer.

During the dinner at the Hotel Jefferson, St. Louis, Mo., telegrams from a great number of friends were received, one from the Governor and one from the Mayor. It was a family party of great interest and marked another step forward in the progress of the company.

•

Louisiana Group Makes Plans for Convention

Program for the annual meeting of the Louisiana Engineering Society, to be held in New Orleans January 12 and 13, has been announced.

Among those who will make addresses are George W. Wheelwright III of the Polaroid Corp., Boston, who will speak on "Polaroid—The Light Control Material—Its Applications"; Otto de Lorenzi of the Combustion Engineering Co., Inc., New York, who has taken for his topic, "Furnace Design for Burning Liquid, Gaseous and Pulverized Fuels," and Harold A. Levey, consulting chemist and industrial engineer, New Orleans, "Production of Modern Plastic Products."

Output Climbs Toward Pre-Holiday Peak

Exceeding, by 2 per cent, the previous all-time record attained in October and matched, after the dip due to Thanksgiving, in the week of December 2, the output of energy by the electric light and power industry rose to a new maximum, 2,585,560,000 kw.-hr., in the week ended December 9, according to the Edison Electric Institute.

This indicates an increase of 11.5 per cent over the corresponding week a year ago. The rate of gain is not far from the average for the past month, although somewhat under that prevailing in September and October, when it repeatedly exceeded 14 per cent. The indications point, therefore, to a peak that may be around 2,650,000,000 kw.-hr. in the week preceding Christmas.

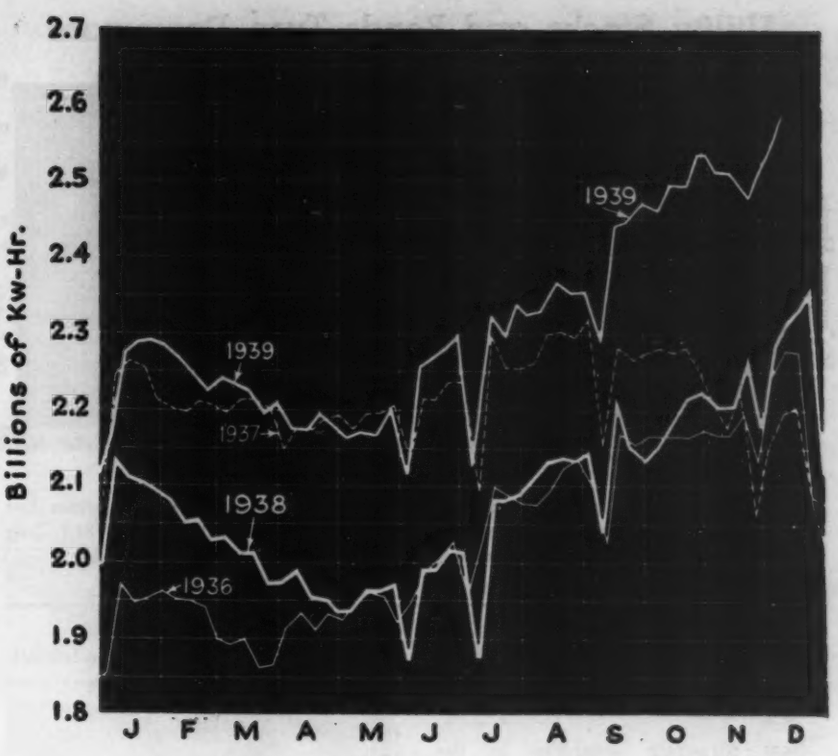
In the rate of increase over 1938 the Central Industrial region again leads, with 14.6 per cent. Next comes the South, which for several months has ranged between 10 and 16 per cent. In the Mountain states more moderate gains continue after the spurt earlier in the year.

Weekly Output Millions Kw.-Hr.

1939		1938		1937	
Dec. 9	2,586	Dec. 10	2,319	Dec. 11	2,196
Dec. 2	2,539	Dec. 3	2,286	Dec. 4	2,153
Nov. 25	2,482	Nov. 26	2,184	Nov. 27	2,065
Nov. 18	2,514	Nov. 19	2,270	Nov. 20	2,224
Nov. 11	2,514	Nov. 12	2,209	Nov. 13	2,177
Nov. 4	2,537	Nov. 5	2,207	Nov. 6	2,202

Per Cent Change from Previous Year

	Week Ending		
	Dec. 9	Dec. 2	Nov. 25
New England	+ 9.7	+ 3.5	+19.6
Middle Atlantic	+ 8.7	+10.4	+ 9.5
Central Industrial	+14.6	+15.1	+16.0
West Central	+ 5.9	+ 9.0	+ 8.8
Southern States	+11.7	+13.4	+14.0
Rocky Mountain	+ 8.0	+ 5.6	+ 6.4
Pacific	+ 8.7	+ 5.6	+ 6.8
United States	+11.5	+11.1	+13.6



RLM Standards Institute Approves Specifications

RLM Standards Institute at its recent annual meeting in Cincinnati approved a revision in the specifications which increased the reflection factor of porcelain enamel reflection surfaces on all RLM reflectors from 77 to 78 per cent.

Members also approved a change in the specifications which increased the output of the RLM Dome reflector to 78 per cent.

The institute also adopted a set of specifications for a new RLM 48 twin lamp fluorescent unit which will be made available by various manufacturers of RLM lighting equipment.

The membership also approved an advertising and promotion budget of $8,000 for the announcement of these changes and new units.

•

New Bonneville Division

A system planning and marketing division within the Bonneville Power Administration has been formed to expedite power delivery and sales throughout the area. This division, which supersedes the old project and contract division, will utilize existing personnel, with James I. Metcalf as acting chief.

•

Bay State Merger Leads to Rate Case Activity

An appropriation of $3,000 to meet expenses involved in pressing a rate case against the United Electric Light Co. before the Massachusetts commission was approved recently by the Springfield City Council in connection with pending proceedings before the state board looking toward a consolidation of various utility units of the Western Massachusetts Companies group in the interests of corporate simplification.

Assistant City Solicitor Carroll stated that as a large user of electrical energy the city is interested in the price of electricity and in contractural relationships between the United Electric Light Co. and the Turners Falls Power & Electric Co. in relation to electrical supply. The city has apparently not as yet been convinced of the desirability of the merger. The Board of Aldermen also approved the appropriation.

Gerard Swope to Head City Housing Authority

Gerard Swope, who will retire as president of the General Electric Co. on December 31, was elected chairman of the New York City Housing Authority on December 11, fifteen minutes after he had been appointed as a member of the authority by Mayor F. H. LaGuardia.

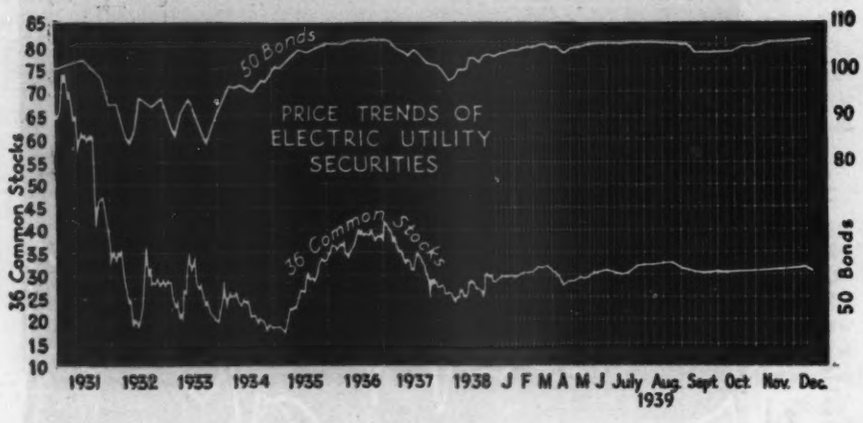
Mr. Swope succeeds Alfred Rheinstein, who recently resigned. He will start on a vacation cruise on December 29 and will assume active direction of the authority upon his return in March.

•

Approves 825-Mile System

Project involving the construction of an 825-mile power transmission system of the Lower Colorado Electric Co-operative has been approved by the REA, according to an announcement by Lee McWilliams, superintendent of the co-operative. Power for the system will be purchased from the Lower Colorado River Authority. The new rural system will serve approximately 1,600 customers, Mr. McWilliams said.

Utility Stocks and Bonds Turn Downward


PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
50 Bonds
35 Common Stocks
35 Common Stocks
50 Bonds
1931 1932 1933 1934 1935 1936 1937 1938 J F M A M J July Aug. Sept Oct. Nov. Dec.
1939

Following the general market trend, prices of electric light and power securities lost some ground this week. "Electrical World" stock index, 31.4; last week, 31.7; last year, 28.2. Bonds were slightly lower. Bond index, 106.0; last week, 106.1

New Utility Issues Total $48,000,000

New corporate securities in the amount of $48,000,000, comprising 4 per cent series A first mortgage bonds and 3⅞ per cent serial debentures of the Public Service Co. of Indiana were offered last week. The $38,000,000 of first mortgage bonds were offered at 102 and the $10,000,000 serial debentures were priced to yield from 0.65 to 4.20 per cent, according to maturities, which range from Sept. 1, 1940, to Sept. 1, 1949.

Proceeds of this financing will be used in redeeming or retiring at maturity eight higher coupon rate issues now outstanding, the total principal amount of which, plus the redemption premiums, aggregates $47,908,289. Following the retirement of these securities, the two new issues will constitute the only funded debt of the company.

•

Subsidiary Stock Voted As Dividend

North American Co. has announced that a distribution of 3,900 shares of common stock of the Washington Railway & Electric Co. would be made to holders of common stock of North American on a pro rata basis. Marking a new policy for North American, this distribution, which is to be made on December 29 to holders of record of December 6, will reduce North American's common stock interest in Washington Railway & Electric by nearly 6 per cent. The distribution will be made in the form of participating units of beneficial ownership which will not be issued in fractional form. Each participating unit will represent one-fortieth of a share of Washington Railway common and the dividend will be at the rate of one participating unit for each fifty shares of North American common.

Since no certificates for fractional units will be issued, stockholders of North American will receive cash at the rate of 33 cents a share for each share held in place of fractions of units, this cash distribution being based on the market value of $660 a share for Washington Railway & Electric common.

•

More Utilities Pay Dividend Arrears

Directors of the Minnesota Power & Light Co. have declared a dividend to cover the balance of unpaid cumulative dividends on the company's preferred stock in addition to the regular full dividend on the issue for the quarter ending December 31. The declaration represents, according to M. L. Hibbard, president, an additional dividend of $1.38 per share on the 6 per cent and $6 stocks and $1.60 per share on the 7 per cent stock. Dividends are payable, with the quarterly disbursement, on January 2.

Arkansas Power & Light Co. voted to clear up arrears on the preferred stocks, with the declaration of a $7 dividend on the $7 issue and one of $6 on the $6 preferred. Both dividends are payable on December 20. Regular quarterly dividends were also declared, payable on January 2.

Public Service Corp. of New Nersey declared a dividend of 65 cents a share on its no par value common stock for the last quarter of 1939, payable on or about December 20 to stockholders of record December 1. The dividend on the no par value common stock for the first and second quarters was 60 cents a share each quarter, and for the third quarter 65 cents a share.

Federal Light & Traction Co. voted a dividend of $1 a common share. The previous payment was 25 cents in December, 1938.

United Corp. authorized a dividend of $1.05 on the $3 preference stock, clearing arrears on the issue.

•

American Gas Files $30,000,000 Issue

American Gas & Electric Co. has filed with the SEC a declaration covering the proposed issuance and sale of $30,000,000 of sinking fund debentures, a temporary bank loan of not more than $20,000,000 and 355,623 shares of $100 cumulative preferred stock. The company, which also proposes to change its common stock from no-par value to a par value of $10 a share, said the net proceeds from the sale of the debentures and preferred stock, together with certain funds from its treasury, would be used to refund outstanding securities.

The company has called a special meeting of stockholders for January 3 seeking approval of a change in the company's charter to permit the issuance of 355,623 shares of $100 par value new preferred stock, so that all the present 355,623 shares of $6 no-par preferred outstanding can be redeemed and discharged.

Potomac Edison Co. has filed a notification of registration under the Holding Company Act.

Narragansett Electric Co. has filed a declaration in connection with short-term bank loans to finance construction costs temporarily.

SEC has approved proposed plan of corporate simplification for Community Power & Light Co. under provision of Section 11 of Public Utility Holding Company Act.

General Water, Gas & Electric Co. has filed an application for an order of the commission exempting it and each of its subsidiary companies from the provisions of the Holding Company Act.

Utility Reports

	Net Income 1939	1938
*Alabama Power	$4,074,331	$3,528,692
*American Power & Lt. and subs.	10,142,588	9,564,427
*Calif.-Oregon Power	976,089	891,415
*Consumers Power	9,425,266	8,959,401
*Dallas Power & Light	1,605,558	1,606,360
*Georgia Power	5,343,758	4,531,491
*Louisiana Power & Lt.	1,037,320	903,572
*Montana Power and subs.	3,114,974	2,521,541
*Mountain States Power	581,236	479,335
*Nevada-Calif. Electric and subs.	352,579	470,813
*Oklahoma Gas & Electric	2,830,413	2,405,638
*Pennsylvania Pwr. & Lt.	8,503,033	7,750,247
*San Diego Consol. Gas & Elec.	1,393,700	1,369,761
*Southern Colorado Power	264,823	220,524

*Twelve months ended October 31.

OPERATING PRACTICES

Plastic Tip Is Aid to New Trouble Lamp

By RAY BLAIN
Washington, D. C.

A new type of trouble lamp which makes use of the "piped light" principle of the plastic "Lucite" is proving most useful for making precision adjustments around delicate machinery or tools. It also has the advantage that its light is not glaring and the rays are "bent" so as to place the light at the point where it is most needed, even in confined places.

This trouble lamp consists of a tubular lamp case assembly with a No. 243 Mazda lamp mounted near the end and providing a concentrated beam of light of high intensity by means of a lens which is part of the bulb. The reflector tip, made of clear "Lucite," has one end tapered to fit the white cap at the end of the lamp case assembly, while the other end is provided with a step and a 45-deg. bevel to give a direct and right-angle projection of the light beam. A magnifying glass held to the case by a spring clamp gives a magnification of about 2½ diameters. The white cap at the end of the lamp case assembly serves as a switch as it is turned.

Trouble lamp "pipes" light to work

The lamp operates from 2.3 volts; a current-limiting resistance is used in series with the lamp when it is designed for higher voltages. The lamp is distributed by Graybar Electric Co.; for operation on 48 volts, it is known as No. 510A tool equipped with W2BL cord.

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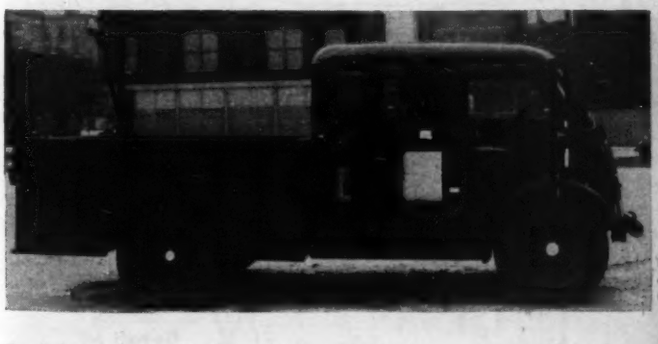
Welded Hooks Save Time, Cost, Weight*

By WALTER D. MYERS
and MICHEL FOURNY
Engineering Staff
Safe Harbor Water Power Corporation,
Baltimore, Md.

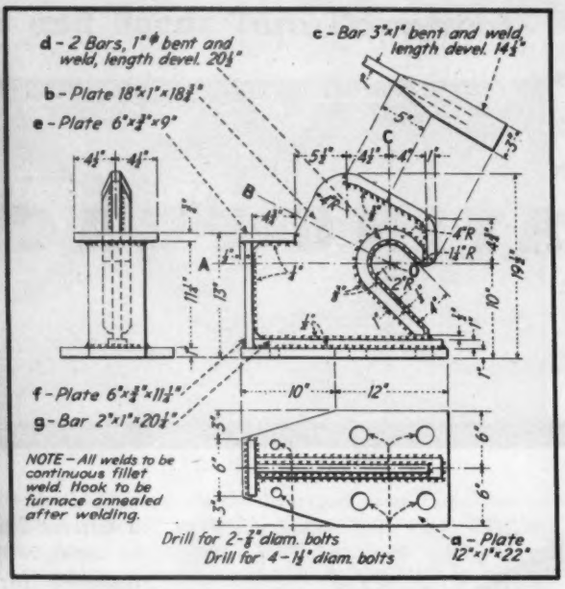
By using arc-welded steel plates in the fabrication of lifting hooks for draft tube gates savings of 20 per cent in weight and of nearly 36 per cent in cost were realized and the hooks were completed in one-third

*Adapted from award paper of the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.

Truck for Cleaning Manholes



Truck has a hydraulic dump body and an air compressor driven by the truck engine through a power takeoff (left). Compressor furnishes air for a pneumatic water pump, a pneumatic bucket hoist (right) and for ventilating manholes. Tool compartments are located under the dump body and in the rear of cab. There is ample room in the cab for six men. A large metropolitan company finds this equipment convenient and economical.


d - 2 Bars, 1" ϕ bent and weld, length devel. 20½"
c - Bar 3"×1" bent and weld, length devel. 14½"
b - Plate 18"×1"×18¾"
e - Plate 6"×¾"×9"
f - Plate 6"×¾"×11½"
g - Bar 2"×1"×20¾"
NOTE - All welds to be continuous fillet weld. Hook to be furnace annealed after welding.
Drill for 2-⅞" diam. bolts
Drill for 4-1½" diam. bolts
a - Plate 12"×1"×22"

Arc-welded lifting hooks for draft tube gates effect savings over cast hooks

Old type lifting hook (top, left)—Weight, 250 lb.; time to complete, six weeks; cost, $57.20. Arc-welded lifting hook (bottom, left)—Weight, 200 lb.; time to complete, two weeks; cost, $36.68. Cross-section of new design (right) shows hooks are shaped as beams, except for short stretch where cross-section is that of tee.

the time required for the steel castings formerly used. No loss in strength or serviceability has become apparent; both types of hooks were designed for a lifting force of 25,000 lb. and the new gates and hooks have been satisfactory with regard to safety, operation and water-tightness.

Draft tube gates are used in hydroelectric power plants to close the exit or downstream ends of draft tubes in order to unwater the turbine pits for inspection of the turbines. Two combination hooks and seats are fastened to the top of each gate to engage rings on a lifting beam that is handled by cables from a traveling gantry crane.

•

Use Safety Devices for Unloading Poles

A method for unloading poles as developed by the Alabama Power Company has proved safe, flexible and economical, according to *Power-grams*, employee publication of the company. Size or condition of load does not affect its application, it is said, and two men in a passenger car carrying this equipment can do the job, instead of a crew with a truck and winch, as formerly required.

The pole unloading problem had two phases: Binding the load to the car while removing the stakes from the unloading side and releasing this binding after the skids were in place and the stakes removed. A suitable tripping device, called a "Safety Trip" by the utility safety man who developed and patented it, solved the problem. The application of the device is indicated in the accompanying illustration.

Two "safety trips," two 25-ft. lengths of ½-in. 6x19 stranded wire rope and two binding plates make up the unloading equipment. Following a precautionary inspection of the load for any defective tie wires, misplaced poles or damaged stakes, a "safety trip" is placed above each of two empty stake pockets on the side opposite the unloading area and 6 or 8 ft. from the end of the load; the binding plate is bolted beneath the pocket. Thimble of the wire rope is hooked over the tripping device and the other end passed over the load, through the pockets on the opposite side of the car and fastened with wire rope clips. Binding plates are tightened and a hand line tied in the tripping lever of each device and the ends carried beyond the end of the car.

After the tie wires and bands have been cut and the stakes on the unloading side removed, the locking pin is removed from the "safety trip" and then the load is tripped by jerking the hand lines simultaneously, allowing the poles to roll down the skid poles. Any poles that do no roll off the car are removed with cant hooks.

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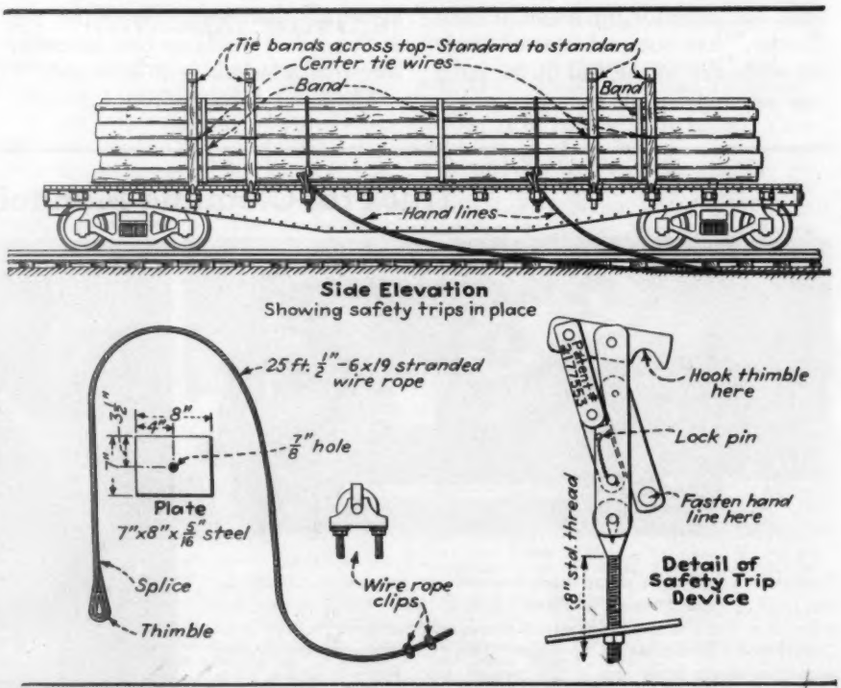
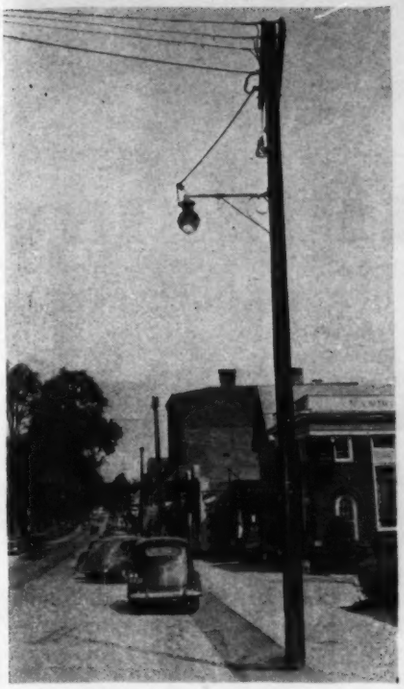
Economical Wiring For Street Lighting

To minimize the material required in serving street lights the Weymouth (Mass.) Light & Power Co. utilizes a twin-conductor aerial cable on the



Simpler pole unloading method proves safe, flexible and economical



Twin-conductor aerial cable and diagonal service to street lamp

cross-street service to the pole shown, terminating the span at a single strain insulator on the crossarm.

From an adjacent insulator a diagonal connection, also in cable, is dropped at a 45-deg. angle to a pin-type insulator on the outer end of the bracket pipe.

From this point a run of a few inches connects with the lamp, the bend under the hood cap taking the place of a drip loop. Only three small insulators are used in the set-up, and excellent clearance is provided by the separation of street-lighting conductors from the secondaries shown in the span and diagonal service to the lamp.

•

Install Limiters on L. V. Networks—III

By C. P. XENIS and E. WILLIAMS
Consolidated Edison Company of New York, Inc.

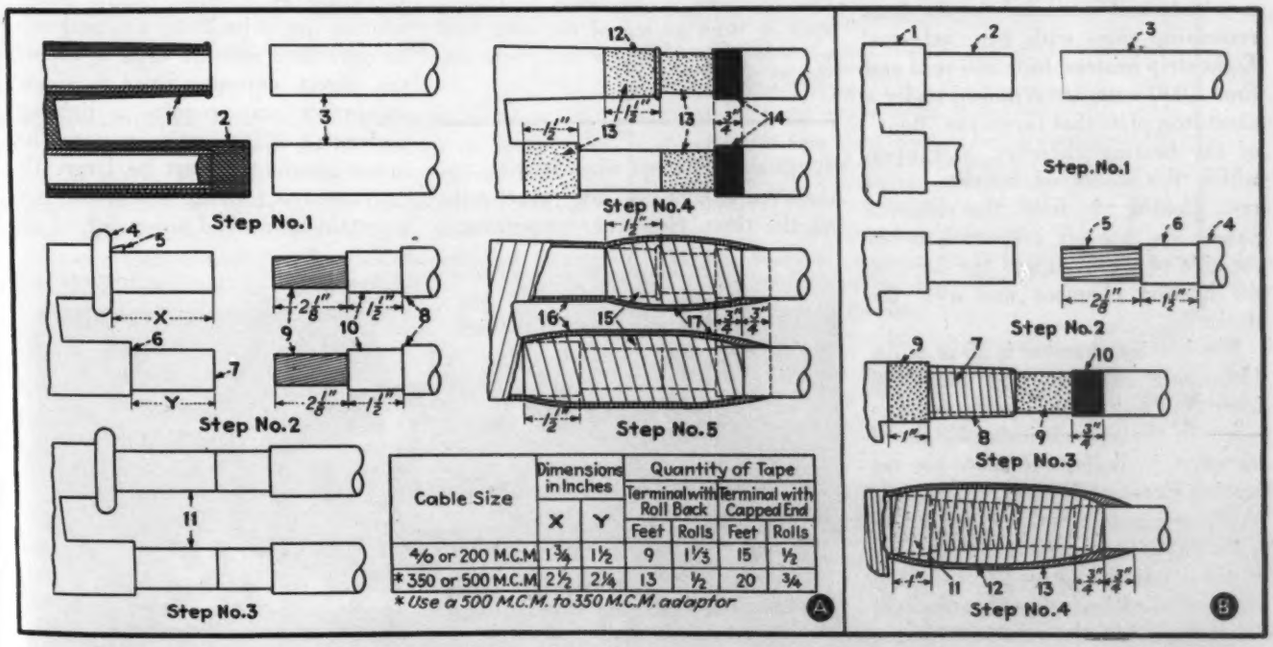
When rubber-insulated, lead-covered cables are used these procedures are followed in installing crab joints:

(A) Non-fusible crab joint installations:

1. Non-fusible crab joint terminal with rubber insulation having roll-back feature.
2. Non-fusible crab joint terminal with rubber insulation having capped end.
3. Rubber-insulated lead-covered cable.
4. Roll back rubber insulation to expose tubular copper terminal of crab joint.
5. Install rubber wedge to hold rolled-back rubber insulation in position.
6. Cut back rubber insulation on capped terminal to expose tubular copper terminal.
7. Remove all traces of rubber insulation from inside and outside of tubular copper terminal.
8. Cut back lead sheath.
9. Remove insulation and clean strands thoroughly.
10. Remove all braids and tapes.
11. Make compression joint with press; make one indentation for No. 4/0 or 200,000-circ.mil cable; make two indentations for 350,000 or 500,000-circ.mil cable.
12. Unroll rubber insulation.
13. Roughen rubber insulation with abrasive cloth. Apply thin, even coat of rim cement. Brush off excess cement and allow to dry one minute before applying tape.
14. Clean lead sheath. Apply thin, even coat of rim cement and allow to dry one minute before applying tape.
15. Apply Kerite or Uskorona tape half-lapped with sufficient tension to reduce its width from ¾ to ½ in. See table for amount of tape required.
16. Cover entire crab joint and rubber tape (Kerite or Uskorona) with two half-lapped layers of friction tape applied with considerable tension in order to compress under layers of rubber tape.
17. Finish by applying one coat of U. S. Rubber Products Co. rubber expansion joint paint or equal over friction tape.

(B) Fusible crab joint installation:

1. Fusible crab joint rubber insulation.
2. Fusible crab joint tubular copper terminal.
3. Rubber-insulated, lead-covered cable.
4. Cut back lead sheath.
5. Remove insulation and clean strands thoroughly.
6. Remove all braids and tapes.
7. Make compression joint with press; make one indentation for No. 4/0 or 200,000-circ.mil cable; make two indentations for 350,000 or 500,000-circ.mil cable.
8. Apply ¾-in. asbestos tape half-lapped. Build up flush with surface of crab joint shell. Woven asbestos sleeve or sheet may be used instead of tape if more convenient.
9. Roughen rubber insulation with abrasive cloth. Apply thin, even coat of rim cement. Brush off excess cement and allow to dry for one minute before applying tape.
10. Clean lead sheath, apply thin, even coat of rim cement and allow to dry for one minute before applying tape.
11. Apply Kerite or Uskorona tape half-lapped with sufficient tension to reduce its width from ¾ to ½ in. For No. 4/0 or 200,000-circ.mil cable use 17 feet (approx. 2/3 roll); for 350,000 or 500,000-circ.mil cable use 22 feet (approx. ¾ roll).
12. Cover entire crab joint and rubber tape (Kerite or Uskorona) with two half-lapped layers of friction tape applied with considerable tension in order to compress under layers of rubber tape.
13. Finish by applying one coat of U. S. Rubber Products Co. rubber expansion joint paint or equal over friction tape.



Cable Size	Dimensions in Inches		Quantity of Tape			
			Terminal with Roll Back		Terminal with Capped End	
	X	Y	Feet	Rolls	Feet	Rolls
4/0 or 200 M.C.M.	1¾	1½	9	1⅓	15	½
* 350 or 500 M.C.M.	2½	2¼	13	½	20	¾

On rubber-insulated, lead-covered cables the crab joint is installed in these manners: (A) Non-fusible crab joint; (B) Fusible crab joint

INDUSTRIAL ENGINEERING

Oven Warms Bakelite Before Stamping

By ELOF SANDSTROM
Plant Superintendent
Oak Manufacturing Company
Crystal Lake, Ill.

Bakelite to be successfully punched or formed should be preheated to 100–120 deg., depending on the grade of material, before it is worked, otherwise the material, which is brittle when cold, may chip or break. To keep punch press operators constantly supplied with properly warmed bakelite strips, from which we stamp the insulating members of radio switches, a 6-kw. low-temperature convection oven has been built which is used beside the press, within easy reach of the operator.

Six of these ovens are in use in the plant at present. Fundamentally, the oven is a sheet-iron box feeding at the two ends and insulated on the four remaining sides with ½-in. asbestos. Eight strip heaters, four 500 watt and four 1,000 watt, are arranged under a sheet-iron plate that forms the "floor" of the heating chamber, and upon which the stacks of bakelite strips rest. Heated air from the elements passes up through a space between the side of the oven and the floor of the heating chamber and over the stock.

The heating chamber is 15 in. wide, 45 in. long and 4½ in. high, measured from the "floor plate" to the ceiling; however, the over-all inside height of the oven, including the space for the heating elements, is 10 in. The oven is 56 in. long and 34 in. high over all.

The eight heating elements are connected in parallel across 220 volts and are controlled by a three-heat switch. "High" provides the total 6,000 watts, "medium" 3,000 watts and "low" 1,500 watts. Except when heating up, the oven is kept on "low" practically all the time. However, temperatures as high as 360 deg. can be obtained if desired. No thermostat is used. It is estimated that the ovens consume from 12 to 20 kw.-hr. per eight-hour day when in constant operation.

Low-temperature, electrical convection oven is stock-warming adjunct to bakelite stamping press

Operator finds it convenient to keep a stock of strips on top of the oven, from which he draws to keep several stacks continually in the oven.

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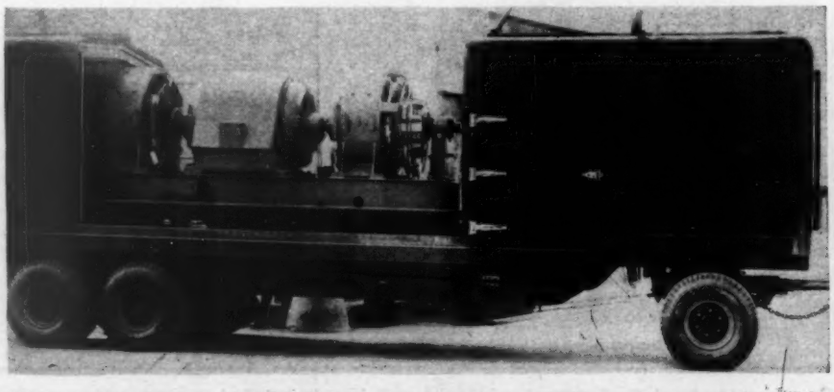
Silent Substation for Cinema Production

By G. F. MAUGHMER
Los Angeles Office
General Electric Company

In addition to glamor girls and expensive sets, high-intensity illumination without incidental noise is fundamental to talking-motion-picture production.

In movie lighting a great deal of direct current is used in order that arc, as well as incandescent, lamps be non-stroboscopic and as nearly flickerless as possible. Studio power sources are principally a.c. and motor-generator sets are used to supply the direct current. Since a single movie set may require a lighting current of 30,000 amp. or more, the motor-generators must be large. Of course large rotating machines emit a certain amount of noise and, of all



"Silent substation" with soundproof cover over motor-generator section removed

New THINWOL

REG. U. S. PAT. OFF.

an 85% NEW-RUBBER INSULATED CABLE

AN insulation thickness of only 0.015 inch requires high tensile strength. *I.M.S.A. calls for a minimum initial value of 3500 lb per sq in. The insulation on the new G-E Thinwol cable is guaranteed to meet that; in fact, average test results show 5250 lb per sq in.

Moreover, this insulation will retain its strength for years. After seven days' oxygen-bomb aging, it tests 4031 lb per sq in.

Electrically, too, Thinwol cable rates high. An insulation thickness of 0.015 inch on a conductor No. 18 Awg will stand a test of 1500 volts.

TESTS 5250 lb per sq in.

New G-E Cable Now Available for Fire-alarm, Traffic-signal, Supervisory-control, and Other Multiconductor Control Circuits

Savings Plus Safety

Such properties add up to savings in duct space—and in maintenance—with an increased factor of safety.

Thinwol insulated cable is thus well suited for a variety of control circuits—voltages up to 220 a-c or 450 d-c.

All types are available: braided, leaded, tellurium-rubber-sheathed, or lead-sheathed metallic-armored.

The First Cable of Its Kind

In the production of Thinwol, G-E engineers correlated the most recent developments in the technology of rubber and rubber-like resins. Then they utilized modern continuous-cure extrusion methods in applying the insulation to the conductor. The result is the *first* control cable made with an 85-per-cent new-rubber insulation by the conventional mixing, extrusion, and vulcanizing process.

More details about properties of Thinwol control cable are given in Bulletin GEA-2423. For a copy address the nearest G-E sales office or General Electric Company, Dept. 6-201, Schenectady, N. Y.

*International Municipal Signal Association (Specification No. 16)

TEST RESULTS

The following are actual results from normal-run samples —they are not guarantees.

PHYSICAL PROPERTIES

a. *Initial properties*
Tensile strength, minimum, in pounds per square inch . . 5250
Elongation at rupture, minimum, in per cent 740

b. *After 96 hours' aging in oxygen bomb at a pressure of 300 pounds per square inch and a temperature of 70 C (158 F)*
Tensile strength, minimum, in pounds per square inch . . 4491
Elongation at rupture, minimum, in per cent 653

c. *After 168 hours' aging in oxygen bomb at a pressure of 300 pounds per square inch and a temperature of 70 C (158 F)*
Tensile strength, minimum, in pounds per square inch . . 4031
Elongation at rupture, minimum, in per cent 623

MOISTURE ABSORPTION

Moisture Absorption after Immersion in Distilled Water at a Temperature Not Less than 70 F

Maximum Dielectric Constant after One-day Immersion 2.64

Maximum Per Cent Increase in Dielectric Constant after Immersion
1st to 15th Day 7.2
8th to 15th Day 1.9

INSULATED CABLE
ALWAYS THE RIGHT TYPE FOR EACH JOB

GENERAL ELECTRIC

520-184

things, noise is taboo in talking-picture work.

At the studios machinery noise was originally avoided by installing motor-generator sets in a substation building remote from the sound stages. But as lighting requirements grew the practice was established of placing a portable motor-generator substation right alongside the sound-stage building in order that additional current could be delivered to the set without increasing the capacity of the main substation-to-stage d.c. bus. Even though they were outside the stage building the portable sets introduced a difficult noise problem.

It was a problem present in location work as well as studio shooting. On many locations a.c. power is available and a portable a.c. substation is taken along. Avoiding noise meant locating the substation at a point quite distant from the scene of action. The long cable runs introduced such difficulties as cost, time and voltage drop.

Silent Substation

Silent substations would be a boon to location as well as studio work for they could be placed immediately at the scene of action, thus eliminating noise and cable-run problems. Silent substations are just what Metro-Goldwyn-Mayer Studios of Loews, Inc., recently built—soundproof, portable, a.c.-d.c. substations, each having a maximum output of 4,800 amp. at rated voltage for one-quarter hour.

Each is mounted in a six-wheel standard-gage trailer and covered by an 8-in. soundproof body. Forced ventilation is accomplished through soundproofed ducts. The body, of polished steel outside, is 28 ft. long by 8 ft. wide and houses a 300-kw. General Electric motor-generator set and control equipment.

The set is built on an extra rigid, welded and cross-braced base which floats away from the trailer frame on rubber.

Each set is driven by a 450-hp. induction motor, designed to operate from 2,300 or 4,600 and 4,000 Y volts at either 50 or 60 cycles. Mounted on the same base with, and directly connected to, this motor are two 150-kw., 120/125-volt, compound-wound generators. These have a.d.c. ripple of less than 0.5 per cent, and the difference between the rising and falling compound curves is less than 1.5 volts. No-load voltage is 120, full-load 125, and the voltage curve between these points is almost a straight line. The machines will carry 200 per cent load for fifteen minutes and will meet all these specifications at either 50 or 60 cycles without mechanical changes. These portable substations were designed and built under the supervision of Lou Kolb, chief of the electrical department of the studio, who says their performance has been highly gratifying.

A.C.-D.C. Drive Is Used for Cable Wrapping

An adjustable-speed electric drive facilitates speed changes in cable-wrapping operations at the Trenton, N. J., plant of the Crescent Insulated Wire & Cable Co.

To insure an even twist to the finished cable the insulated wire, drawn simultaneously from several supply reels mounted on a rotating table, must move at a uniform speed through the wrapping or taping head and onto the capstan. So both the rotating table and the capstan are driven by a constant-speed motor, operating through the same chain drive to both units.

For various diameters and specifications of cable, however, the amount of wrapping which is wanted will vary. Changing the speed of rotation of the wrapping head, or the rate of passage through it, or a combination of the two, are the choices of methods available to change the amount of lap of the covering tape. For this reason the taping head, carrying two spools of cable tape, is independently driven to permit a wide range of operating speeds.

Replaces Gear System

A new Reliance V*S drive—5 hp., operating on 440 volts, three phase, 60 cycles—has replaced the system of gears and pinions formerly used to obtain speed changes. It is connected to a standard 230-volt, 1,750-r.p.m. d.c. motor; a speed variation of approximately 4 to 1 is now available simply by turning a speed adjuster handle conveniently located beside the start-stop buttons on the frame of the machine.

Despite the fact that both the d.c. motor and the adjustable-speed unit operate in an atmosphere heavily laden with talc and soapstone dust, there has been no interruption, no breakdown and no unusual maintenance. Time out for making speed changes has been eliminated, production has been speeded up and increased uniformity of product made possible.

Conveniently located controls facilitate speed changes of taping head
Insulated wire from supply reels (background) is drawn through taping head (center) onto capstan (foreground) at uniform speed. Taping head is independently driven by d.c. motor (arrow) connected to adjustable-speed unit (right foreground).

15 DIMENSIONS GAUGED IN ONE OPERATION

Precision analyzer enables inspector to measure 15 dimensions of meter-frame casting and to determine their relationships with a high degree of accuracy

YOU will recall that the foundation of an I-30 watthour meter is formed by the main frame, a high-grade casting. The machining of this casting requires extreme precision in order to maintain accuracy of product and to make sure that each meter has the same wide-limit characteristics.

With this multiaction gauge, developed by G-E engineers, the inspector can determine whether the castings come within the exeeedingly close tolerances necessary. In a single, simple operation he can do the work faster and more accurately than by the older, tedious hand method. In this way it is possible to machine frames by the thousand and still maintain an accurate check of all the dimensions.

This is but one of the many details that contribute to G-E meter progress. Milestones—such as the Types I, I-14, I-16, I-20, and I-30 meters—represent the major steps forward, but such detailed progress as is illustrated by this precision analyzer is continuous. Taken all together, they result in improvements in quality—and thus in performance—and often in economies to industry. General Electric Company, Schenectady, N. Y.

An Invitation

Would you like to visit our plant at West Lynn, Mass.? We extend a cordial invitation. It's an interesting trip; we think you will find it most profitable. Take a day or more if you can; but if you've only an hour, come just the same. Make arrangements through the nearest G-E sales office.

1889 1939

GENERAL ELECTRIC

400-37

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

NEW ENGINEERING IDEAS

Peak Limiter Made of Meter Parts

A peak limiter, into which can be introduced different time delays for opening and closing the controlled circuit, and which operates like a meter—in fact, has been built from old meter parts—has been developed by E. J. Singrey and L. R. Spaulding of Northwestern Electric Company, Portland, Ore. A patent is applied for.

Two economical features are that: (1) It is adaptable to socket mounting and can be an integral part of a two-element meter; (2) it employs a mercury switch, thus eliminating contact maintenance. Furthermore, it suggests a way of using up old meter parts.

The unit consists of a three-wire, 25-amp. winding on a common core with a second winding which is connected to a secondary winding on the potential coil through an adjustable resistance as shown in the wiring diagram.

The potential coil, connected across the line, energizes the closed second circuit around the current coils and causes the limiter's disk to rotate. Bucking this rotation is the effect of the three-wire winding carrying the load curent. Thus as load increases the disk turns slower, is motionless at peak and turns in the opposite direction when the current exceeds peak.

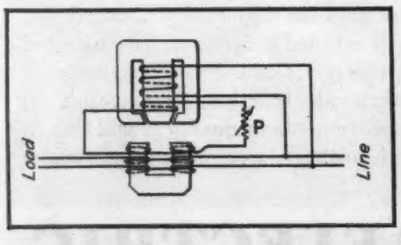
Through a gear train, the motion of the disk is caused to move the mercury switch. By changing the gear ratio and by employing gear trains which are inoperative for one direction of motion any degree of time delay can be introduced. By adjusting the resistor the peak point can be changed.

Contemplated use is for control of water heaters, the limiter being introduced on services ahead of all load except the water heater.

It might, for example, be desirable to have a one-minute turning-off time, enough delay to prevent a transient load, like that of a motor starting, from opening the switch. On the other hand, a one-hour turning-on time might be desired. Such a ratio of opening to closing times could be secured by introducing 60/1 gears, operating in only one direction.

Portland experiences a 5:30 p.m. residential peak caused by electric ranges. Tests have indicated that whereas in the past peak limiters could be expected to disconnect no more than three out of eight water heaters during peak hour, the new limiter with 60/1 turning on time can be expected to disconnect seven out of eight. Properly adjusted, the limiter can be made to yield several off periods of short duration, thus diminishing the chance of exhausting hot water, yet flattening the load curve. The total of these has been shown to be, on the average, two hours and 55 minutes between 4 and 8 p.m.

Composed of old meter parts, the limiter can be an integral part of a socket-type meter



Wiring scheme. Principle is that load increase causes element to turn slower, to reverse its motion as peak is passed

Molds and Dies Electroformed

Devised originally for duplicating tire molds, a new electroforming process recently disclosed by E. H. Wallace of the United States Rubber Company's laboratory development staff is available for general die and mold production. Known as the EKKO process, it is particularly applicable where designs are ornamental or where a multiplicity of dies or molds are required for volume production. Exact replicas are obtained, even to craftsman's tooling marks in the case of silverware.

Pure iron is deposited from an electroplating solution directly on the surfaces of the pattern which has been rendered conducting by means of graphite. Almost anything but aluminum or zinc can be the material of the pattern; these two metals are attacked by the plating bath. The die or mold is built up to $\frac{3}{8}$ in. thickness or whatever is desired and then backed if necessary. Force dies can be made to allow for clearances by

HERE'S HOW YOU SAVE WITH G-E UNIT SUBSTATIONS

Accessibility of controls for inspection and adjustment is evident in this view of a single-circuit unit substation, installed in a substation of the Alabama Power Co., at Montgomery, Alabama

They're Easy to Install . . . .

because they're completely assembled at the factory

They're Inexpensive to Install . . . .

because they require no elaborate overhead structure

They Reduce Losses . . . .

because they can be installed near load centers—even in residential areas where conventional overhead structures would be objectionable

They Reduce Real Estate Expense . . . .

because their compact design decreases their space requirements.

EACH of these points means savings for you—sometimes totaling as much as *twenty-five per cent!* Then, too, the unit substation is easily moved to a new location, a valuable advantage if load grows in an unanticipated direction.

When you're planning to serve a new area, be sure to get the complete story on unit substations from your G-E representative. General Electric, Schenectady, N. Y.

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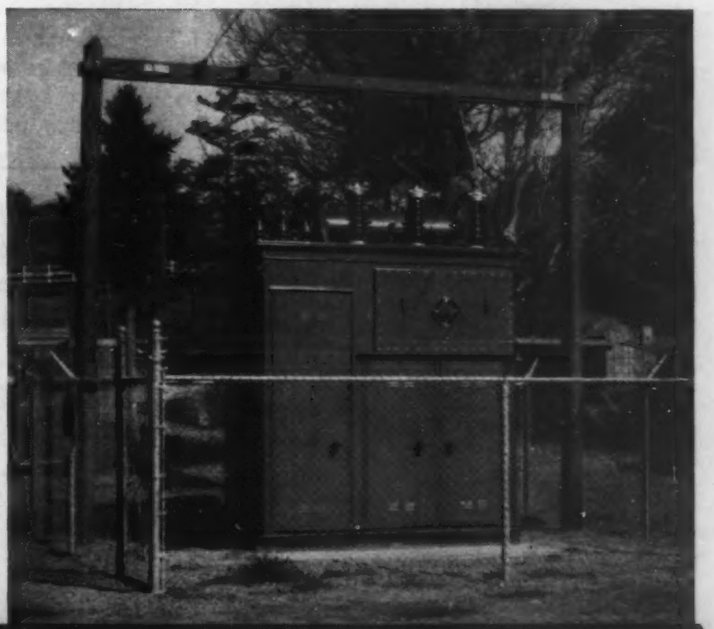

The simplified overhead structure and the compact substation unit provide an attractive installation for the Coast Counties Gas and Electric Company at Felton, Calif.

GENERAL ELECTRIC

an intermediate stage which electroforms a detachable replica of the pressed or stamped product. The electroformed iron is 99.98 per cent pure and about 50 per cent harder than cold rolled steel.

Articles made by the new molding and pressing procedure include: Headlight lenses, bonbon dishes, artificial human hands, radio dials, plastic jewelry, leather goods. Replicas in relief are obtainable from photographs by first employing the Ford Ceramic Arts process to obtain a raised original. For work on plastics the original pattern is made conducting by depositing a film of gold in an evaporative flashing process conducted in a vacuum.

U. S. Rubber has established a division at Detroit to make molds and dies for the trade and may later license others to engage in the process.

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How Cable Training Affects Sheath Life

By M. C. HEDGES
Assistant Research Engineer
Commonwealth Edison Company, Chicago

Expansion and contraction of underground cables due to daily loading cycles appears at the duct mouth in manholes as cable movement which causes 40 to 50 per cent of our sheath trouble. These cost more than $10,000 each year for repairs and premature replacements of 500,000 circ.mil, three-conductor, 12-kv. cables alone. Past improvements in cable training, duct-mouth protection and in fireproofing application have brought some improvement, but still longer sheath life appears possible.

When a cable moves in a manhole the added length in the manhole must be offset by decreased chord length and radius of curvature of bends or by transverse movement of the joint toward the wall, or both. This stretches the lead sheath on the periphery of convex arcs and compresses it on concave arcs of the cable. Theoretical considerations, and experience, indicate that an unrestrained joint will tend to move without appreciable changes in radius of the bends, much as though the cable from duct mouth to joint wipe is a rigid bar pivoted at these points. This causes maximum transverse joint movement and concentration of bending at the joint wipe and duct mouth and results in early formation of sheath cracks.

The desirability of restraining joint movement is indicated in the accompanying curve, since anchoring the joint eliminated the high strain in the joint wipe region and resulted in uniform strain along the bends.

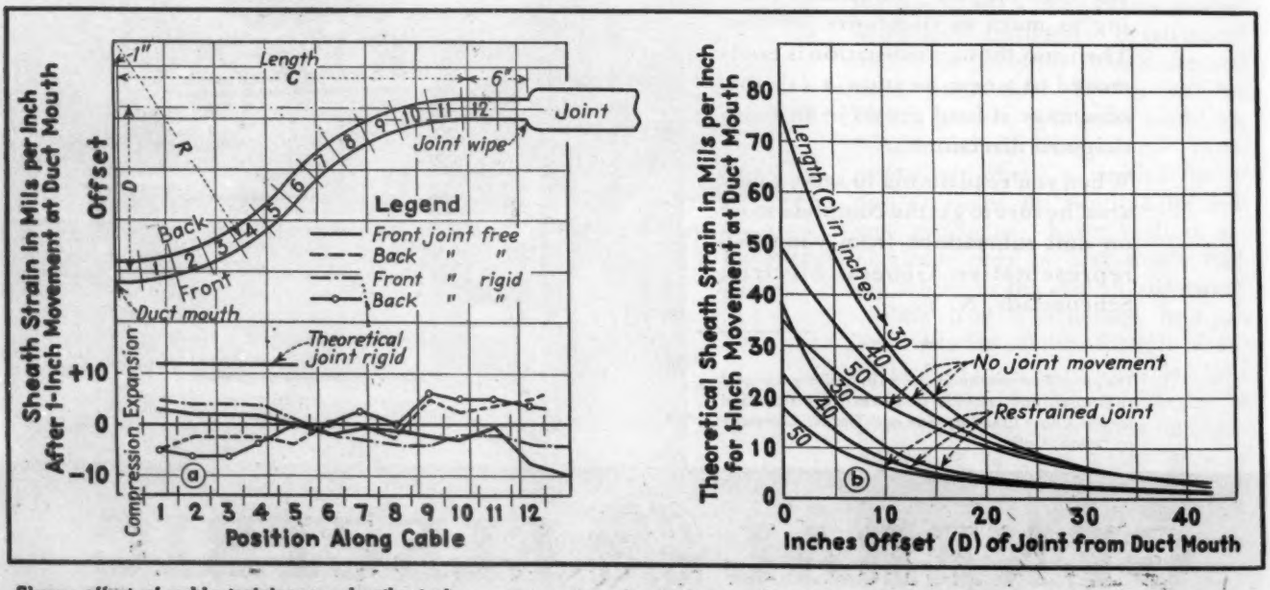
Theoretically, minimum and uniform sheath strain should be induced if the joint movement is limited to approximately 70 per cent of the "rigid bar" amount. Anchoring the joint should result in uniform strain, but it will be two or three times the minimum in magnitude. Calculated values of strains for these two propositions are shown in illustration (b). Either anchoring the joint or restraining its movement requires an external force to relieve the moment of force normally in the cable in the joint wipe region when free movement occurs. Anchoring appears to be more practicable.

The relative effect of joint offset and longitudinal distance from the duct mouth are also shown in the illustration. Thus, an increase in offset from 20 to 30 in. reduces the duty on the sheath almost 50 per cent. An increase in length from 30 to 50 in. (with an offset of 20 or 30 in.) reduces the duty only 20 to 25 per cent. The value of offset is also shown by laboratory tests:

Inches of Offset	No. of Tests	Average Life (Years)
10 to 20	18	18.1
20 to 30	6	29.2
40 to 50	3	36.8

Less life may be expected in the field, so that offsets should be more than 30 in. to give life expectancy equal to that of insulation.

Offset and length fix the cable bending radius, which must exceed a certain minimum to avoid damage to the insulation. On this basis most manholes on our system are now amply long to permit larger offsets, but they are not wide enough. To install greater offset it would be necessary to train cable downward or upward. Downward training appears very desirable, since it also results in restraint of the joint movement due to the component of force acting vertically against the supporting brackets.



Shows effect of cable training on sheath strain
(a) Measured sheath strain along cable. (b) Theoretical sheath strain with uniform bending from duct mouth to joint wipe

Where oil fights oil

G-E No. 634 Black Bias Varnished Cloth Tape is packed in oil to protect it from dampness, drying conditions, and injurious fumes and acids. That's why it's FRESH when you're ready to use it. It CAN'T easily DETERIORATE!

This G-E Tape offers great resistance to oil and has a high dielectric strength. It is specifically designed for taping solid-filled joints in oil-treated-paper or varnished-cloth insulated cables rated 23 kv and less.

Your cable joints will last long, be strong mechanically, and more nearly equal in dielectric strength to the original insulation if you use G-E No. 634 Black Bias, Oil-packed Varnished Cloth Tape.

G-E No. 1786 Black Bias Varnished Cloth Tape has excellent resistance to oil and heat. High dielectric strength and easy application help No. 1786 to give you cable joints which last a long time.

It is designed for taping compound-filled joints in oil-treated paper or varnished-cloth insulated cables rated 23 kv and less.

Both G-E No. 634 and No. 1786 Tapes are available in .007, .010, and .012 thicknesses.

Return this coupon now for more information on the G-E Varnished Cloth Tapes which are famous for their ability to make cable joints last a long time.

Section M-91112, Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn.

Send immediately more information on G-E Tapes, No. 634 and No. 1786.

Name.....

Address.....

City.....

GENERAL ELECTRIC

LOAD BUILDING

Four Oklahoma Roaster Campaigns Analyzed

By B. C. SPENCER
Sales Development Department,
Oklahoma Gas & Electric Company, Okla. City

There are 8,846 electric cookers (roasters) now being used by customers of the Oklahoma Gas & Electric Company in Oklahoma. They were purchased through local dealers in co-operation with the O.G.&E. cooker campaigns, first introduced in June, 1935. Each year following we have had two major campaigns, one in the spring, during May, June and July; the other in the fall, during November and December.

Sales data show that 49 per cent of our annual cooker sales are made during May, June and July and 27 per cent are sold during November and December. Although we make every attempt to maintain buyer interest throughout the year with training schools, advertising and home calls by our home service department, the campaigns receive special attention.

All our campaigns are conducted through dealer co-operation, since electric companies in Oklahoma do not sell merchandise. In general, the Oklahoma Gas & Electric Company pays 50 per cent of the dealer advertising; prize money is paid to the salesmen for the sale of cookers, tables and broilers; cash prizes for the high salesmen are given in department stores where storewide campaigns are organized; radio spot announcements are utilized in co-operation with the dealer, and prizes are given for the most effective windows displaying cookers.

As an experiment, one of the food markets in Oklahoma City distributed several thousand handbills advertising the merits of the electric cooker and offering special prices on electrically prepared hams, roasts and barbecued ribs. A large window sign was used, along with banners and streamers, throughout the store advertising barbecue specials. Various models of cookers were displayed in the store. Food was prepared in cookers on the market counters so that the customers could see the food as it was being cooked. A sales woman served small portions of barbecued meat to the customers and made sales. As a result, 300 pounds of ribs, 60 pounds of roast and five hams were sold during a two-day demonstration. Similar demonstrations were held in stores in various sections of the city. Many markets have now purchased cookers as permanent fixtures for the preparation of meats.

These demonstrations not only "sold" the food market owners on electric cookers, but gave the public a chance to see the electric cooker in

Better Inspection With Fluorescent

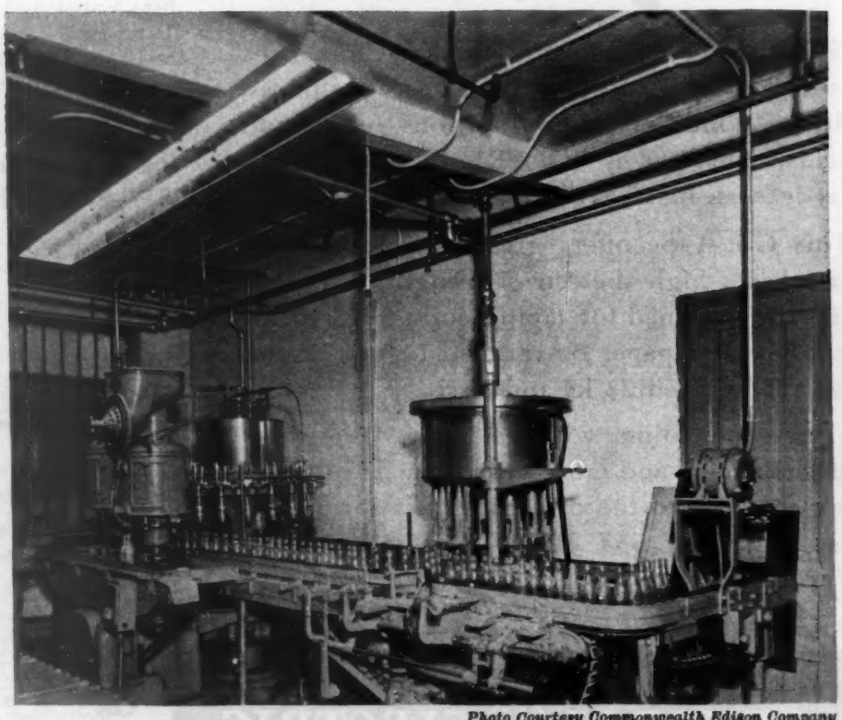


Photo Courtesy Commonwealth Edison Company

Above the bottling machines of Chocolate Products Company, Chicago, six 30-watt daylight fluorescent lamps in three double units are mounted 7 ft. from the floor. This provides lighting of about 50 ft.-candles of good color value for inspection of bottles as they move along the conveyor belt to be filled and capped.

Selling lamps and lighting in LOS ANGELES

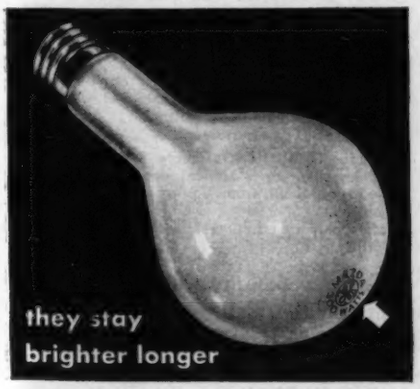
View of Los Angeles, population 1,360,000

Photo courtesy of Los Angeles County Chamber of Commerce

HERE'S the way that General Electric advertising is constantly at work in Los Angeles, promoting light-conditioning for Better Light-Better Sight. Into Los Angeles homes every week goes a steady stream of G-E lamp and lighting advertisements amounting to 66 impressions per person in the last ten years.

IN 1939 . . . 6,210,000 magazines with General Electric lamp advertisements and 1,955,000 radio messages.

SINCE 1929 . . . 65,205,000 magazines with General Electric lamp advertisements.



FALL 1938 . . . 3,868,200 copies of Los Angeles newspapers with G-E lamp advertisements.

LAST 3 YEARS . . . 16,836,700 newspapers with G-E lamp advertisements.

SINCE 1929 . . . 89,866,700 advertisements in magazines, newspapers, and radio . . . which is approximately 66 advertisements per capita.

AND FOR ANY CITY . . . Your own for instance, you can easily estimate the approximate number of lamp and lighting advertisements General Electric is delivering to your customers by applying the following national averages:

Going into the average wired home in 1939

14 magazines with G-E lamp ads
5 newspapers with G-E lamp ads
5 radio messages
24 total advertising messages

• • •

In the last 10 years, the average wired home received

158 magazines with G-E lamp ads
30 newspapers with G-E lamp ads
20 radio messages
208 total advertising messages

G-E MAZDA LAMPS

GENERAL ELECTRIC

action and an opportunity to judge the superior flavor of electrically cooked foods. We feel, therefore, that these demonstrations are very beneficial.

Every locality has its sales problem; ours is the competition of cheap fuel. In Oklahoma natural gas (1100 B.t.u.) is available to our customers at 45 cents per thousand cubic feet. Practically every business here is in some way influenced by the oil and gas industry, so our customers are naturally accustomed to cooking with gas. It is only through the cooker that we have been able to prove to our customers that electrically prepared foods are better. The cooker also proves to the customer that electric cookery is not expensive, and we believe this is the reason electric range sales have gradually increased. The past September was the best range month our company has enjoyed.

Not Called a "Roaster"

In building up acceptance on the electric cooker, we have refrained from calling the appliance a roaster, as the name "roaster" is too limiting. From the utility standpoint this means much. For this reason we do not stress the roasting feature of the cooker, but advertise it with its baking and complete meal features. We believe the public will accept the name of "cooker" as a year-around, all-purpose cooking device.

The average kitchen does not have a place where the cooker may be conveniently used, and, as a result, it is sometimes shelved, so we feel that the cooker is incomplete without the table. We do not participate in advertising the cooker through window displays or newspaper cuts unless the table is shown. This requirement, and the fact that we pay prize money to the salesmen for the sale of tables, has resulted in 70 per cent of our cookers being sold with tables.

For our fall campaign, which started in November, there were a series of newspaper advertisements by the leading stores, supported by radio spot announcements from the key radio stations throughout the state. During this series of broadcasts the electric casserole was introduced. However, it carried the name of the "junior cooker," rather than casserole. Our surveys and tests show there is a vast market open for this appliance.

In addition to our usual amount of co-operation with the dealer, we participated in the cost of a group of premiums, namely, broiler, electric iron, waffle iron and coffee maker. Any one of these items, having a list price of not more than $5.50, is given as a premium with the purchase of an electric cooker. The dealer, the distributor and the utility share in the cost. By our participation in the expense of the campaign in co-operation with the dealer we are able to maintain prices. Premiums have been used in all our campaigns for the past two years, yet at no time have we had a price war or even an infringement by the dealer.

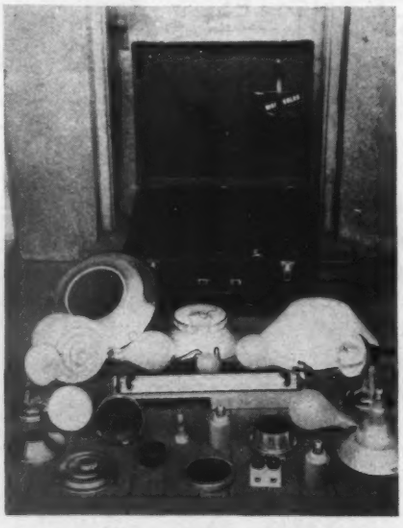
• • •

Selective Selling Reclaims Revenue

By H. G. CLUM

Manager Lighting Sales Department, Jersey Central Power & Light Company

Faced by a commercial lighting rate reduction that made its deepest cut, about 12 per cent, in bills of around 150 kw.-hr. per month, and with an analysis of commercial lighting sales effort for three years showing that approximately 80 per cent of the results obtained had been among customers using more than 200 kw.-hr. per month, the Jersey Central Power & Light Company decided on some selective selling to reach the low-use market. Survey showed this market to be comprised mostly of small retail stores, auto service stations and small offices, for which four definite selling factors were apparent: (1) Low unit cost of equipment offered. (2) Equipment capable of installation with a minimum of wiring. (3) Reasonable time payments. (4) Equipment to be sold by the utility because dealers are not interested in small sales from large effort.



The "Black Case" and its contents

1. A plastic semi-indirect conversion unit adaptable to existing chain hangers and accommodating a 300- or 500-watt lamp.
2. A piece of inclosing glassware with a 4-in. or 6-in. fitter having a molded glass louvre in the bottom and equipped with a metal deflecting ring for the purpose of directing some of the light to the ceiling and for ornamentation.
3. A concentrating down-lighting unit for 200- or 300-watt lamps designed to be used on an existing drop cord or chain hanger.
4. A bracket for use with reflector lamps, together with color equipment control lens and other accessories.
5. A short section of a nationally known fluorescent case lighting device complete with auxiliary and cord extension (more an attention-getter than a sales item).

After conferences with manufacturers, the equipment shown in the accompanying picture was selected. The carrying cases were made by a local luggage firm at a cost of $12.50 each. Five field men were given kits and instructed to demonstrate their wares to the little fellows among the commercial customers. Newspaper advertising and post-card notifications to customers prepared the way for the "Man with the Black Case."

Here are the results from two months work:

Total low-use customers contacted	271
Total low-use customers contacted in per cent of total	3.8
Total customers who increased load	*100
Total customers who increased load in per cent of contacted	37
Amount of increased load (100 customers), kw.	95.8
Average increase per customer, watts	958
Number of customers who bought equipment	†54
Number of customers who bought equipment in per cent of those contacted	20
Total value of equipment sold	$781.75
Average sale per customer	$ 14.50

* Includes installations of more expensive equipment installed by electrical contractors as well as load obtained from equipment merchandised by utility.
† Refers only to equipment in "Black Case" sold by utility.

These results justified decision to continue the method of selling as a permanent lighting sales activity. Each salesman is now given a weekly quota of "Black Case" calls to make and it is expected that in about three years all of the more than 7,000 low-use commercial customers of the company will have been called upon.

FRIGIDAIRE

Good as Gold for '40

● Frigidaire, America's No. 1 Refrigerator, leads again! There's a bit of selling magic in its thrilling new features . . . a touch of genius in its exciting new beauty. It's the crowning achievement of a score of Frigidaire successes. A sales-making, profit-making champion like you've never seen before! We say it, and all America will shout it: "It's Frigidaire for '40"!

Soon it can be told. In January, Frigidaire will unveil next year's refrigerator sales leader, the new 1940 Frigidaire with the Meter-Miser. Expect to see something startling in its departure from conventional practice. Let your eyes confirm what words alone cannot reveal.

Simultaneously announced will be Frigidaire's beautiful companions, the new and farther advanced Frigidaire Electric Range—sensation of the industry—and the new Frigidaire Electric Water Heater, literally brimming with sales appeal.

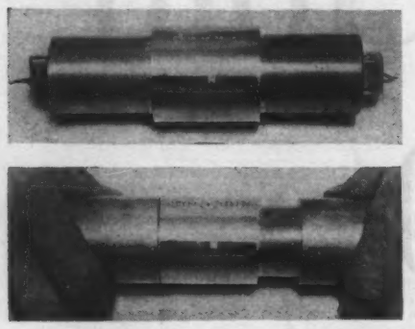
Make no mistake. Frigidaire Dealers, kingpins of the industry, will again have an unbeatable combination of products and selling advantages this coming year. Their profits will mount, as sales volume swells. No idle promises these, for the path is charted, the way is clear. The opportunities of Frigidaire Dealers are "good as gold" in '40!

FRIGIDAIRE DIVISION • GENERAL MOTORS SALES CORPORATION
DAYTON, OHIO

NEW EQUIPMENT

Bus Connector

This bus conector uses no bolts in joining tubular buses, but works through internal expansion wedges to obtain high-pressure contacts on the tubing. Wedges



"Nobolt" bus connector with outside diameter of connector the same as the tubing; comes in all shapes and sizes from ¾ in. s.p.s. up. **Sheldon Service Corp.**, Long Island City, N. Y.

are self-locking to prevent loosening due to vibration. The company claims that, when locked, the connector withstands 3-ton pull-out. A furnished tapered key and a hammer are the only necessary tools to make or break connections.

•

Fluorescent Light

"Miralume" HF-200; 110-125 volts, 60 cycles, a.c. **Hygrade Sylvania Corp.**, Salem, Mass.

Designed for commercial installations chiefly, this new fluorescent lighting unit mounts four 40-watt lamps on a single chassis, and comes complete with necessary starters. The dimensions are length 48½ in., width 10½ in., height 7¾ in. Claimed to be corrected for power factor and stroboscopic effect.

•

Transformer

Redesigned rural-line transformer, type "HEB-F." **Wagner Electric Corp.**, St. Louis, Mo.

Among new features of this transformer are two sets of hanger brackets located 180 deg. apart and welded to the tank. The mounting slots incorporate a "jump-proof" feature that prevents the transformer from being dislocated from the pole because of sudden jolting or hitting of the pole, the company claims. Three low-voltage stud type bushings of new design are used. Two ground lugs equipped with solderless connectors are provided and a new dial type tapchanger has been built in.

•

Transformer Equipment

A light-weight, portable hoist that can be attached to the top of a power transformer to facilitate the handling of radiators or other external fixtures of the transformer has been developed by this company. The hoist consists of three parts, a mounting post which is bolted to the top of the transformer tank, a swinging crane which fastens to the post and projects several feet over the side of the tank and a trolley assembly by which the lifting is done.

To clean transformer tanks and radiator surfaces a new tool has been developed. A ½-hp. motor on a short stand drives a flexible, rubber-incased shaft, 8 ft. long, to which can be attached any of several devices for sanding or grinding.

A demountable hoist to remove power-transformer radiators (pictured); cleaning tool for transformer maintenance not shown. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

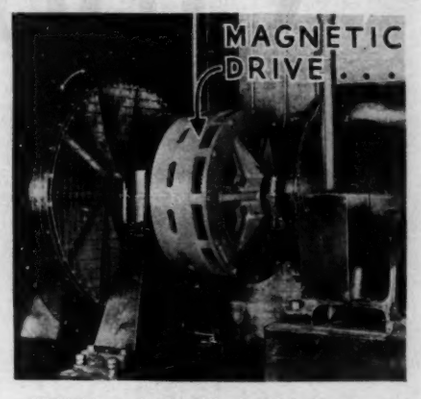
Who Makes What?

"Electrical Buyers Reference:" published annually. **Electrical World**, 330 West 42d St., New York, N. Y.

Names, addresses and products of electrical manufacturers are catalogued in this convenient, annual publication for public utility, industrial, engineering and other major electrical buying interests.

Magnetic Drive

A variable-speed method, using electromagnetic principles for torque transmission, this magnetic drive consists of two simple, compact rotating parts, a flux link-



"E-M Magnetic Drive," placed between constant-speed driving motor and load requiring variable speed to provide a controllable speed; available in a wide range of horsepower and speeds. **Electric Machinery Mfg. Co.**, Minneapolis, Minn.

age ring and a magnetic flux producer. The ring is driven by the driving motor and the magnet revolves within the ring and drives the load shaft. The torque transmitted by the magnetic drive, and hence the speed of the load shaft, is dependent on the magnetic flux in the airgap, which is varied by adjusting the small control current to the magnet.

•

Slide-Contact Rheostats

Removable, ventilated housings on these slide-contact rheostats guard the user from shock or burns and protect the rheostat against mechanical damage. Point of action of the slider knob is at the level of the slider bar, to eliminate tilting and dragging. Metal contact brush is equipped with a "self-lubricator"—two pieces of

"Rex" rheostats; can also be used as potentiometers; resistances available range from 0.33 to 40,000 ohms. **Rex Rheostat Co.**, 37 West 20th St., New York, N. Y.

HE WOULD HAVE BEEN AS INVULNERABLE AS HUBBARD DOUBLE-DIPPED HOT GALVANIZED POLE LINE HARDWARE—GUARANTEED COMPLETELY COVERED WITH SMOOTH, HEAVY NON-POROUS ZINC COATING.

HUBBARD AND COMPANY

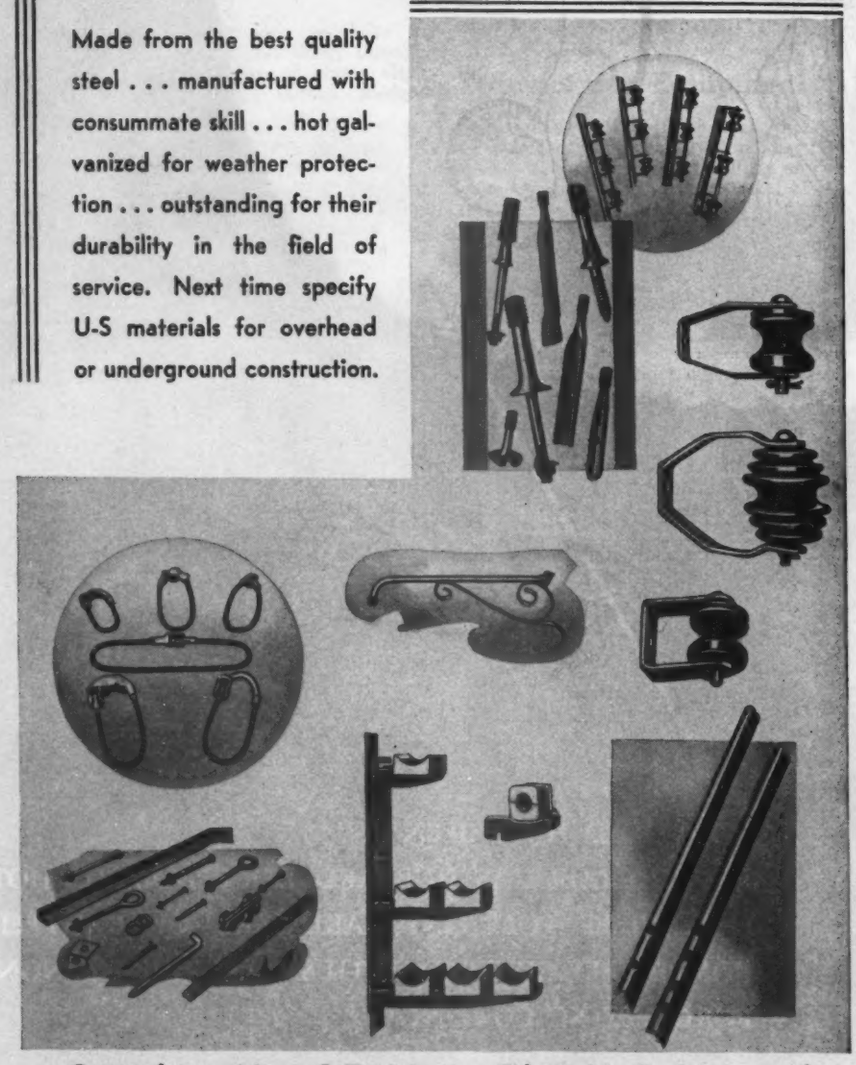
PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"

UTILITIES SERVICE

POLE LINE MATERIALS

Made from the best quality steel . . . manufactured with consummate skill . . . hot galvanized for weather protection . . . outstanding for their durability in the field of service. Next time specify U-S materials for overhead or underground construction.



Catalog No. 37 Lists The U-S Line of DISTRIBUTION . . . TRANSMISSION . . . UNDERGROUND AND STREET LIGHTING EQUIPMENT

UTILITIES SERVICE CO.

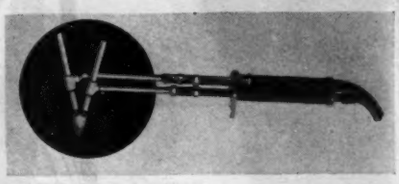
ALLENTOWN PENNA.

graphite inserted in the laminations of the brush which automatically lubricate the sliding path. The porcelain tube is recessed longitudinally and the wire is bent over the edges of these recesses, making for tightness of the winding and exposing approximately 20 per cent of the inner winding surface for cooling.

•

Arc Torch

This arc torch may be used with any a.c. welding machine for general heating jobs, preheating, welding of non-ferrous



Arc torch with two 10-ft. cables, two ¼-in. carbon adapters and a set of two copper terminal lugs. **Marquette Mfg. Co.**, Minneapolis, Min.

metals and such jobs heretofore done by gas-welding equipment. The company states that this torch handles hard solders easily.

•

Blueprint Machine

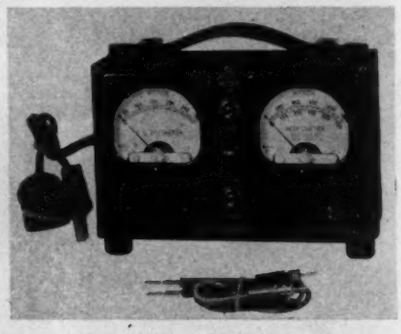
Desk unit blueprint machine; prints black and white as well as blueprints; printing capacity 10 x 18 in.; source of light is a tubular lamp. **Vadenwood Co.**, Cleveland, Ohio.

This desk unit is 34 in. long and 8 in. wide, weighing but 15 lb., and can be plugged into any lighting circuit. The unit is equipped with time switch. Can also be used for patent drawings, duplicating typewritten matter, etc.

•

Volt-Wattmeter

An exclusive feature of the wattmeter is the electrodynamometer movement and a uniform scale. Two sets of leads are supplied—one set of appliance connecting



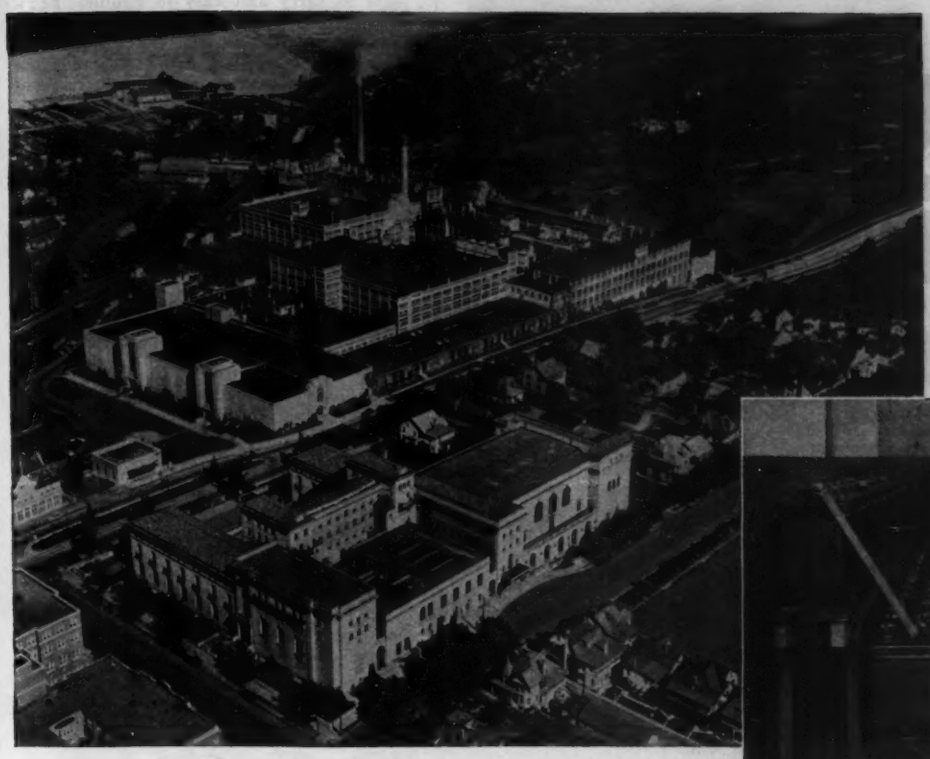
Appliance testing volt-wattmeter, a.c.-d.c.; watts are indicated on two ranges, 0-750 and 0-1,500; voltmeter has range 0-300. **Hickok Electrical Instrument Co.**, Cleveland, Ohio.

cables and one pair of 3-ft. leads with test prods to connect to voltmeter jacks for point-to-point circuit continuity testing. Toggle switch connects voltmeter direct to separate test jacks.

•

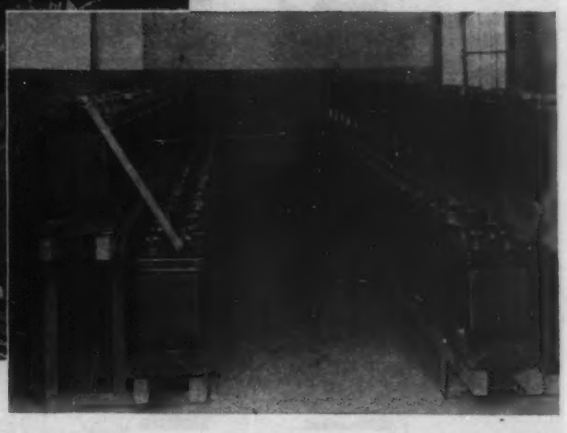
X-Ray Cassette

New "cassettes" for industrial radiography—similar to film packs—remain on the job. The only thing that has to be carried back to the darkroom for reloading are the flexible film folders, which are



The huge plant of the Hershey Chocolate Corporation with its 65 acres of floor space. The windowless office building is shown just below and to left of the plant, while the beautiful community building, center of cultural and recreational life, is shown at bottom center.

The 60-cell Exide-Chloride Battery used for control bus service located in battery room of the power plant.



IN THE WORLD'S LARGEST CHOCOLATE PLANT

—the operation of circuit-breakers, telephones, sprinkler system and lighting is safeguarded by Exide Batteries.

Exide CHLORIDE BATTERIES

FROM Hershey, Pa., better known throughout the length and breadth of the land as "Chocolate Town", the Hershey Chocolate Corporation ships forty to fifty carloads of chocolate daily. The huge plant which makes this tremendous production possible, embraces more than 65 acres of floor space and employs approximately 3500 people. Both the plant itself as well as the windowless, air-conditioned office building which adjoins it, are models of mechanical and electrical efficiency in which Exide and Exide-Chloride Batteries play an important part.

Within the plant, for instance, a 60-cell Exide-Chloride Battery is kept floating on the main control bus for the operation of the oil switches which protect the valuable electrical equipment in service there. For the operation of the auto-call system another Exide is used, while the Company's private branch telephone exchange depends upon a 23-cell Exide. Still another is used to furnish power to the sprinkler system which protects the plant from fire.

Remote as the possibility may be of a light failure, nevertheless in the chocolate wrapping room, a 60-cell Exide-Chloride Emergency Lighting Battery stands ready to supply the needed light instantly and automatically in the event that such a contingency arose.

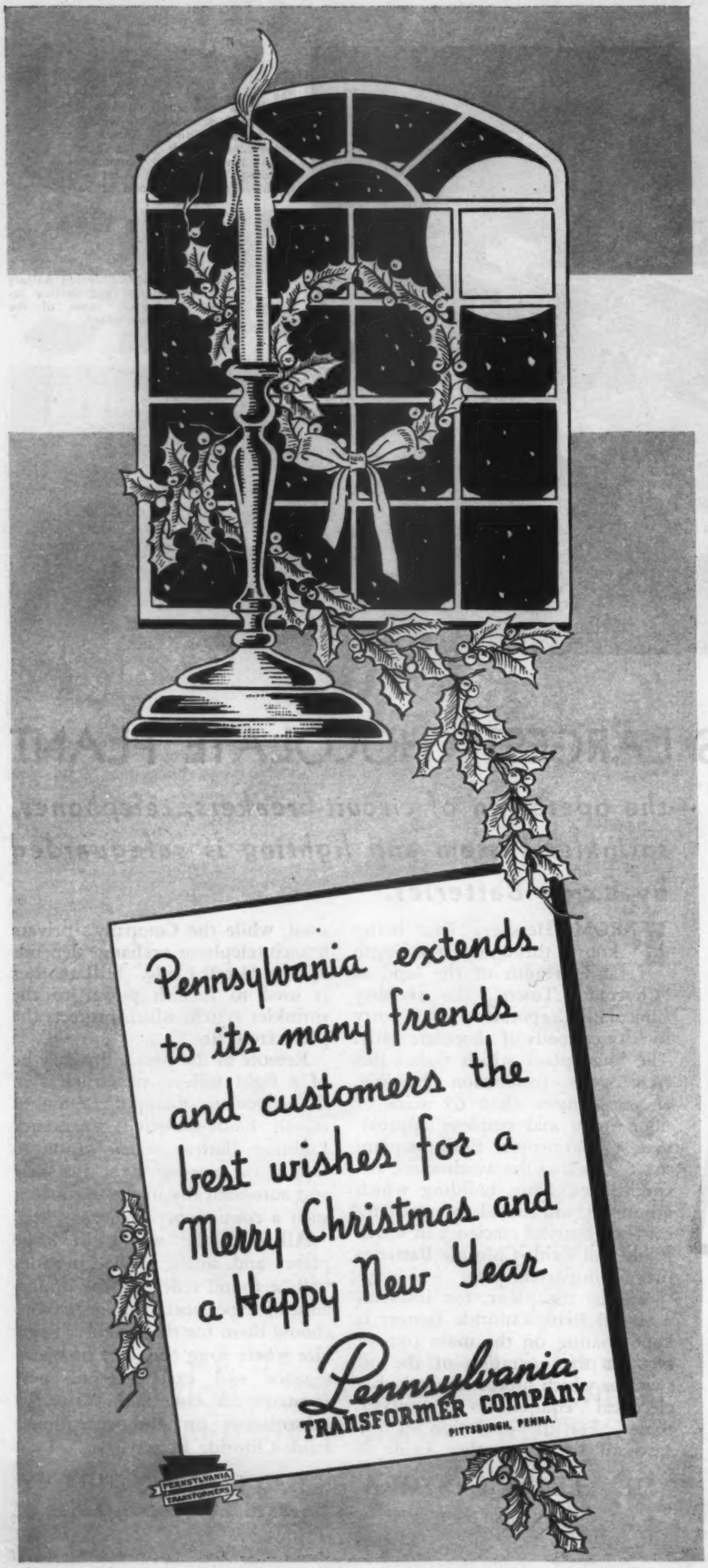
All over the world, in large plants and small, Exide-Chlorides will be found reflecting the preference of experienced engineers who choose them for those fields of service where long life, ease of maintenance and excellence of performance are essential. Write for information on the exceptional Exide-Chloride Battery.

THE ELECTRIC STORAGE BATTERY COMPANY

The World's Largest Manufacturers of Storage Batteries for Every Purpose

PHILADELPHIA

Exide Batteries of Canada, Limited, Toronto



light to carry and easy to handle. Previously, heavy metal cassettes had to be carried around. Another feature is interchangeable filter set fronts. These filter sets can be chosen in accordance with the voltage used and the thickness of the metal to be penetrated. The company claims that having but one cassette facilitates the ease of operation.

"Economy Cassette" for X-ray technicians. St. John X-Ray Service, Inc., Long Island City, N. Y.

•

Immersion Unit

"IR Junior" electric immersion unit; rating from 300 to 1,500 watts, 115 or 230 volts, single or three heat; casing 1 in. in diameter and 10 to 16 in. in length. Harold E. Trent Co., Philadelphia, Pa.

Device consists of the standard unit with gas-tight head. Casings are made of seamless brass, copper, steel or chrome steel. The addition of the gas-tight head is claimed to extend the usefulness of this size of immersion unit.

•

Lineman's Cover Glove

This glove is unusual in that it follows the contours of the underlying rubber glove and is made of imported goatskin,

New cover glove for lineman. Merit Glove Co., San Francisco, Calif.

which, it is claimed, insures pliability and durability under all weather conditions. The thumb is seamless and reinforced.

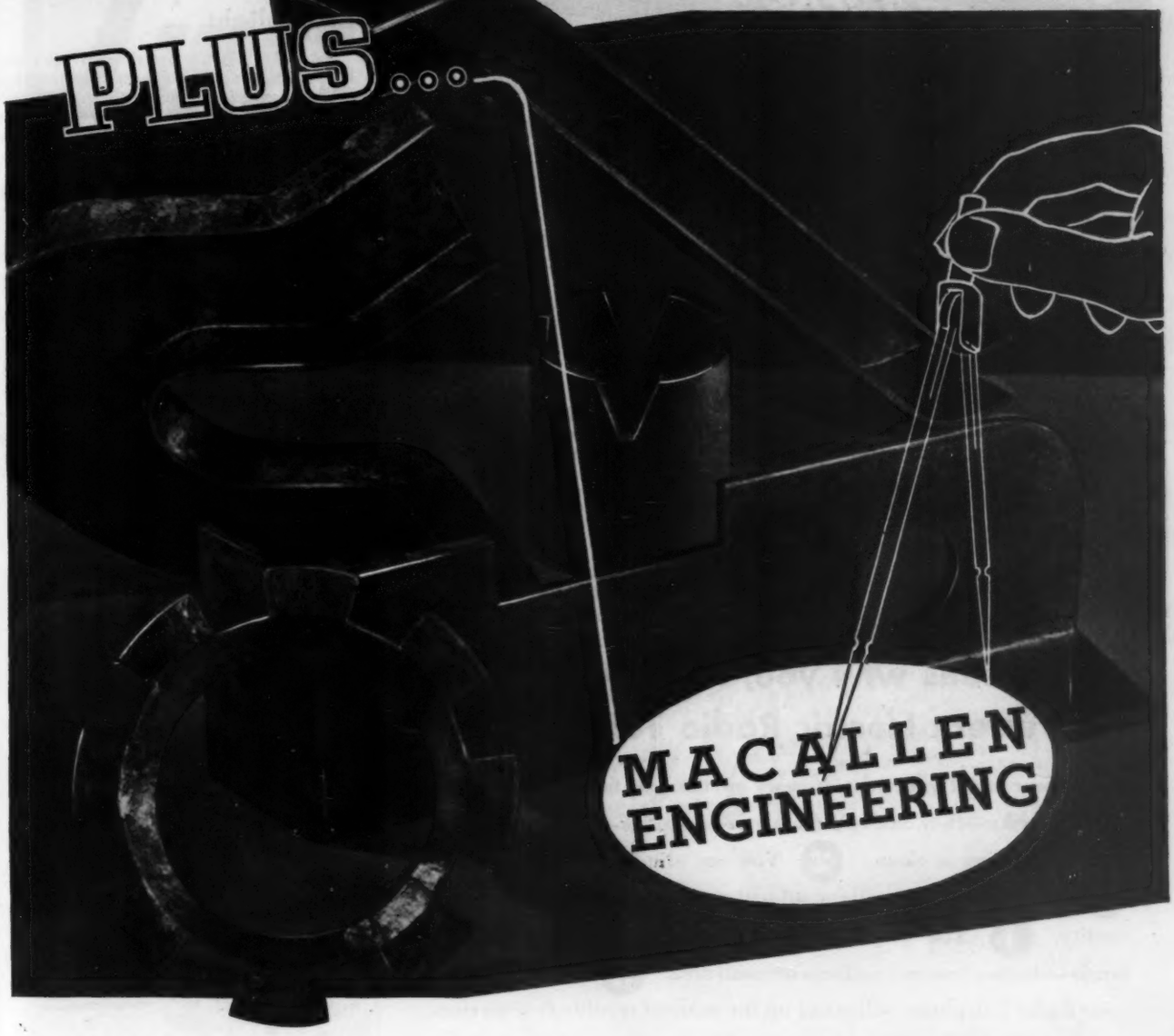
•

Expanding Anchor

Expanding anchors available in small, medium and large sizes. Hubbard & Co., Pittsburgh, Pa.

Expansion is accomplished by driving on the top of the anchor with a standard installing tool or a pipe large enough to

MACALLEN MICA



Along with the ability to process mica into its many industrial forms is the further advantage of full technical cooperation of Macallen engineering —an added assurance of lasting efficiency of performance.

THE MACALLEN COMPANY

16 MACALLEN STREET, BOSTON

CHICAGO: 565 W. WASHINGTON BLVD. CLEVELAND: 1105 LEADER BLDG.

COMPRESSED SHEET · MICA PAPER, CLOTH, TAPE · HEATER PLATE · COMPRESSED SHEET TUBING
COMMUTATOR INSULATION · COMPRESSED SHEET WASHERS · INSULATING JOINTS AND CANOPY
INSULATORS · RAILWAY SPECIALTIES · DOMESTIC AND IMPORTED RAW MICA

5 reasons why you, too, should use Western Electric Radio Telephone

1 You can get your repair crews on the job faster when emergencies strike—they can call for needed supplies—can tell you the minute the line is clear. **2** You can eliminate hazards faster. **3** You can build public good-will through greater service continuity. **4** You can get Western Electric equipment to meet your needs—whether you serve a large or small area. **5** You can be sure your Radio Telephone will stand up for years of trouble-free service.

It's designed by Bell Telephone Laboratories and backed by Western Electric's experience not only in making telephones but also in meeting the varied radio requirements of airlines, police, ships-at-sea and broadcasting stations. Get full details. Write Graybar Electric Company, Graybar Building, New York, N.Y.

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Distributed by Graybar

Western Electric
RADIO TELEPHONE EQUIPMENT

slide off over the eye. A small wire secures the wings in the closed position until the first blow is struck, which breaks the wire, allowing the wings to take their first "bite" into the walls of the hole. When the wings are completely spread the sound of the blow changes to a solid impact of metal against metal, making the final stage of expansion easy to detect.

•

Searchlight

Small capillary water-cooled mercury lamps are used in this searchlight, which produces a beam of more than 25,000,000 cp. Three of the high-pressure lamps are mounted close together within a regulation searchlight and do not require the care

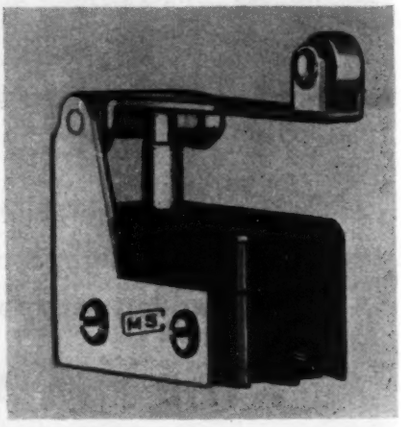
Water-cooled mercury searchlight with three high-pressure lamps, each rated at 1,000 watts. General Electric Co., Schenectady, N. Y.

which the carbon arc needs. The company says that this new light should replace the plain carbon arc for searchlight use, but will still be below the present high-intensity searchlight in beam candlepower and effectiveness.

•

Attachable Actuator

Two mounting holes on this actuator register with the mounting holes on the limit switch, making it possible to use the mounting holes of the switch for attach-



Attachable actuator, "Type J," for regular and metal-clad limit switches. Micro Switch Corp., Freeport, Ill.

ing the actuator. The lever arm of this actuator rides on an oil-less bronze bearing, which rests on the plunger of the switch. A case-hardened roller with an oil-less bronze bearing is mounted on the end of the lever arm, whose operating ratio is about 8 to 1.

BUY LINES

RLM REFLECTORS

For 20 years ETL has been the certifying agency for reflectors made to extremely strict specifications by 8 leading manufacturers in this field.

I E S LAMPS

More than 50 manufacturers produce portable lamps to specifications of the Illuminating Engineering Society. ETL certifies compliance with specifications. More than 4-½ million lamps sold in past 5 years.

FLUORESCENT

All groups interested in fluorescent luminaires and auxiliaries have agreed that certification be looked to for satisfactory introduction. Fluorescent products of 30 manufacturers are now on test at ETL.

ETL

ELECTRICAL TESTING LABORATORIES
East End Avenue at 79th St.
New York

Reproduced from Electrical Merchandising

Modern lighting specifications read: "RLM Reflectors --- never followed by the words "or better"

Consider these millions of IES lamp sales as "YES" answers to a questionnaire reading "Do you prefer to buy a product the high performance of which is certified by an IMPARTIAL testing laboratory?"

A new entry into the certification field. Three makes of luminaires already receiving certification labels -- many more now undergoing test.

NEWS ABOUT PEOPLE

Boyles New Operating Manager in Los Angeles

Recent changes in the supervisory personnel of the operating department of the Southern California Edison Co., following the retirement a few months ago of Fred G. Hamilton, veteran manager of operation, are as follows:

Ralph G. Boyles was appointed manager of operation for the company, succeeding Mr. Hamilton, who retired after forty years of service. Mr. Boyles had been assistant manager of operation for the past five years. In 1940 he begins his thirty-fourth year of service with the Edison company. Starting as a service man in 1906, he has served in the intervening years as district foreman, division superintendent in a number of parts of Edison service territory, was made assistant superintendent of

B. D. Haugh

distribution in 1924 and superintendent of distribution in 1926.

Byron D. Haugh was appointed general superintendent of distribution. In this capacity he also directs the stores and tests divisions. This is a new position in the Edison organization. He had been superintendent of stores and

R. G. Boyles

offices for the past two years. Mr. Haugh joined the Southern California Edison Co. in 1910.

Glen H. Luther, formerly superintendent of the Alhambra division, is now assistant superintendent of distribution. C. M. Cavner, formerly assistant superintendent of substations, is now superintendent of substations, succeeding L. L. Dyer, who retired after 37 years of service. R. N. Coe, formerly assistant superintendent of underground, has been appointed superintendent of underground, succeeding Clayton E. Biggs, who retired after 42 years of service.

•

▶ DOUGLAS F. G. ELIOT, general commercial manager of Western Electric Co. for the past three years, has been appointed general purchasing agent.

▶ BERNARD P. CAREY, counsel of the Philadelphia Electric Co., has been appointed general counsel of the company in charge of the legal department, succeeding the late Arthur B. Huey. Mr. Carey was elected president of the Pennsylvania Electric Association in September.

Senator Cotton to Head Bay State Commission

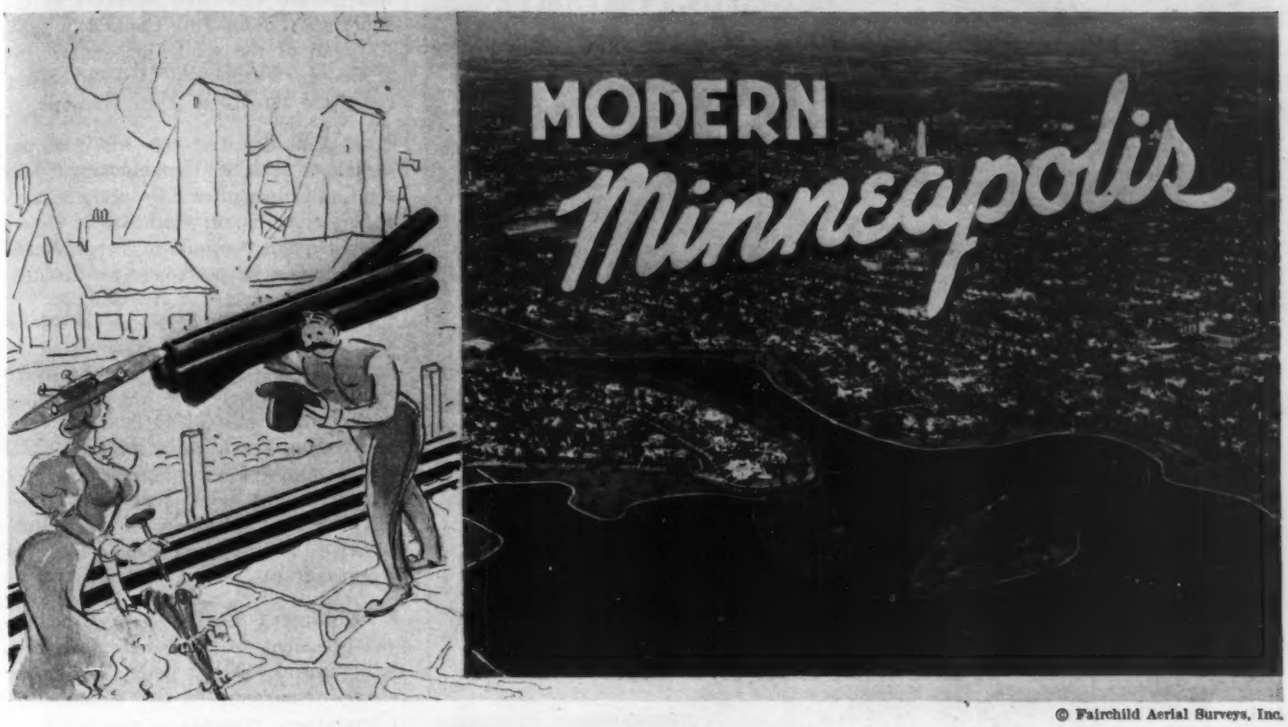
President Joseph R. Cotton of the Massachusetts Senate has been appointed by Governor Saltonstall as a member of the State Department of Public Utilities, with designation as chairman of the board. He succeeds A. C. Webber of Newton, whose term expired December 1. Mr. Cotton is a member of the Massachusetts bar. The present chairman of the board, Francis M. McKeown, becomes a commissioner upon the accession to office of the new chairman.

•

▶ EARLE WALL of Memphis, Tenn., formerly manager for the TVA in the west Tennessee and north Mississippi divisions, has returned to Jackson, Tenn., to take the position of division manager, succeeding EARL W. BAUGHMAN, whose transfer to Tupelo, Miss., as manager in northeast Mississippi has been announced.

▶ FREDERICK M. FEIKER, executive secretary of the American Engineering Council, has been named dean of the school of engineering of the George Washington University, Washington, D. C. Dean Feiker has had wide experience as an engineer, publisher and executive. Following graduation as an electrical engineer from Worcester Polytechnic Institute in 1904, he spent many years in publishing work. He served as editor and chairman of the editorial board of the A. W. Shaw Co. of Chicago, and joining the McGraw-Hill Publishing Co. in 1915 as editor of the ELECTRICAL WORLD, he eventually became vice-president and editorial director of the company. In 1921 Herbert Hoover appointed him Assistant Secretary of Commerce. From 1923 to 1926 he served as vice-president of the Society for Electrical Development and as managing director of Associated Business Papers. He returned to the service of the federal

ORANGEBURG HAS *long* BEEN PART OF



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Minneapolis, Minn., foremost flour and grain center, is built on both sides of the Mississippi River, and studded with many beautiful lakes. Its modern underground distribution system overcomes many unusual difficulties.

Plans for 1940 ?

In planning capital investments for decades of service there are many "points that count".

Check with our sales-agents, when looking forward to 50 and more years of trouble-free underground conduit cable protection service, the sum of

"ORANGEBURG Points that Count"

The Orangeburg trademark is a guarantee of the best of Fibre Conduits, a time-tested, enduring "service" of cable protection wherever electrical raceway facilities are to be installed underground.

● In Minneapolis, ORANGEBURG has successfully withstood many extremes of climate and ground conditions. Its superior moisture-and-corrosion-proof qualities combined with other outstanding ORANGEBURG characteristics are of supreme importance where conditions exceed the norm.

Installed during extremes of winter temperatures or at the height of desert heat, in "flooded" ground or "acid" soil ORANGEBURG will successfully protect expensive underground cables from cable sheath corrosion and afford permanent, usable underground raceway for decades of trouble-free service.

For installation WITHOUT CONCRETE ENCASEMENT: ORANGEBURG STANDARD FIBRE CONDUIT IS recommended for duct banks (4 ducts and over), main distribution, high tension and "downtown" locations.

For installation WITHOUT CONCRETE ENCASEMENT: the ORANGEBURG dual-economy NOCRETE conduit is recommended for service entrances, extensions, parkways, and street lighting, suburban distribution, laterals, signal systems, etc.

Sales Agent—Distributors

GENERAL ELECTRIC SUPPLY CORP. **GRAYBAR ELECTRIC COMPANY INC.**

MADE AT ORANGEBURG, NEW YORK
BY THE FIBRE CONDUIT COMPANY
292 MADISON AVE. NEW YORK CITY

ORANGEBURG *Standard* for installation *with* concrete encasement
NOCRETE for installation *without* concrete encasement

You Can

SPEEDILY

Repair A. C. S. R. Cable with

NATIONAL *Nicopress*

A.C.S.R. REPAIR SLEEVES

Where one or more strands are damaged on A. C. S. R. cable the repair job is mighty simple when you use Nicopress A. C. S. R. repair sleeves. The work is quickly done, without in any way affecting the service, by fitting the Nicopress A. C. S. R. sleeve over the broken strands and compressing it tightly around them with the easily operated Nicopress tool. All need of additional cable is eliminated and the time of making new splices saved.

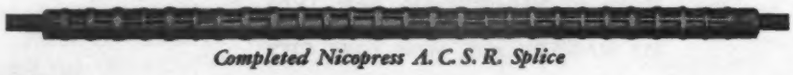
The completed repair splices are strong and tight and restore the A. C. S. R. cable to its normal high efficiency. Write for samples and prices today.

For a Better Job . . . Splice Your A. C. S. R. Cable with *Nicopress* UNITS

You'll save time and money and get ideal splices by using Nicopress A. C. S. R. splicing units. The process of making the splice does not injure either the steel core nor the aluminum strands. Every splice is positively tight—conductors cannot pull out. High conductivity is assured. Completed Nicopress splices are small, compact and neat and develop the full rated strength of the conductor. The job of making the splice is simple, effecting a very considerable saving of labor. Write for prices and samples today.

Nicopress Galvanized Steel Sleeve for steel core of A. C. S. R.

Nicopress Aluminum Sleeve for aluminum strands of A. C. S. R.



Completed Nicopress A. C. S. R. Splice

THE NATIONAL TELEPHONE SUPPLY COMPANY

5100 Superior Avenue Cleveland, Ohio, U. S. A.

government as director of the U. S. Bureau of Foreign and Domestic Commerce, from 1931-1933. Mr. Feiker was elected executive secretary of the American Engineering Council in 1934. As dean of the school of engineering at George Washington Mr. Feiker succeeds the late Dean John R. Lapham.

▶ FELIX W. BOLDENWECK, who has been associated with the Commonwealth Edison Co., Chicago, for 33 years, has been appointed assistant manager of power sales. He will continue in direct charge of the industrial power service division.

▶ HARRY L. BROWN has resigned as assistant Secretary of Agriculture to join the Tennessee Valley Authority as chief of its division of test demonstrations and director of agricultural relations. Mr. Brown has served as Assistant Secretary of Agriculture since 1936. Except for the World War period, during which he served in the Navy, Mr. Brown's life work has been in the field of agriculture.

▶ DR. OLIVER E. BUCKLEY, executive vice-president of the Bell Telephone Laboratories, New York, has been elected chairman of the Engineering Foundation, research organization of the national engineering societies. Dr. Buckley, who has been vice-chairman of the foundation, succeeds the late Prof. George E. Beggs of Princeton University. As director of research of the Bell Telephone Laboratories from 1933 to 1937, he guided fundamental studies in a great variety of fields. Dr. Buckley is a fellow of the American Institute of Electrical Engineers.

▶ G. T. DUNKLIN, assistant sales manager of the merchandising division of the Westinghouse Electric & Manufacturing Co., has been appointed to a newly created position in charge of installment financing, according to an announcement by L. W. Lyons, treasurer of Westinghouse. Mr. Dunklin has been engaged in devising installment financing plans for the merchandising division. He will continue in the New York offices of Westinghouse, taking part in credit and collection activities in the eastern district. A graduate of Purdue University, Mr. Dunklin has been connected with Westinghouse since 1922.

▶ W. E. O'BRIEN has been appointed sales manager of the domestic appliance department of the Toastmaster products division of the McGraw Electric Co. and B. M. RIKER sales manager of the commercial equipment department. Comprehensive plans for intensifying the sales and advertising activities in both departments have made it desirable to place a sales manager in charge of each, according to D. Scott Campbell, executive vice-president of the com-

pany, who announced the resignation of K. C. Gifford as of December 1 to enter another field. Mr. O'Brien was associated with the Aluminum Co. of America and with the Chicago Flexible Shaft Co. before joining the McGraw Electric Co. sales organization in 1934. Mr. Riker has served for the past two years as assistant sales manager of Toastmaster's commercial equipment department. He was formerly manager of commercial and industrial sales for the Rockland Light & Power Co. of Nyack, N. Y., and before that was active in the promotion of commercial cooking, heating, and power sales for Charles H. Tenney & Co. of Boston. For the past twelve years Mr. Riker has served as a member of the National Commercial Electric Cooking Council.

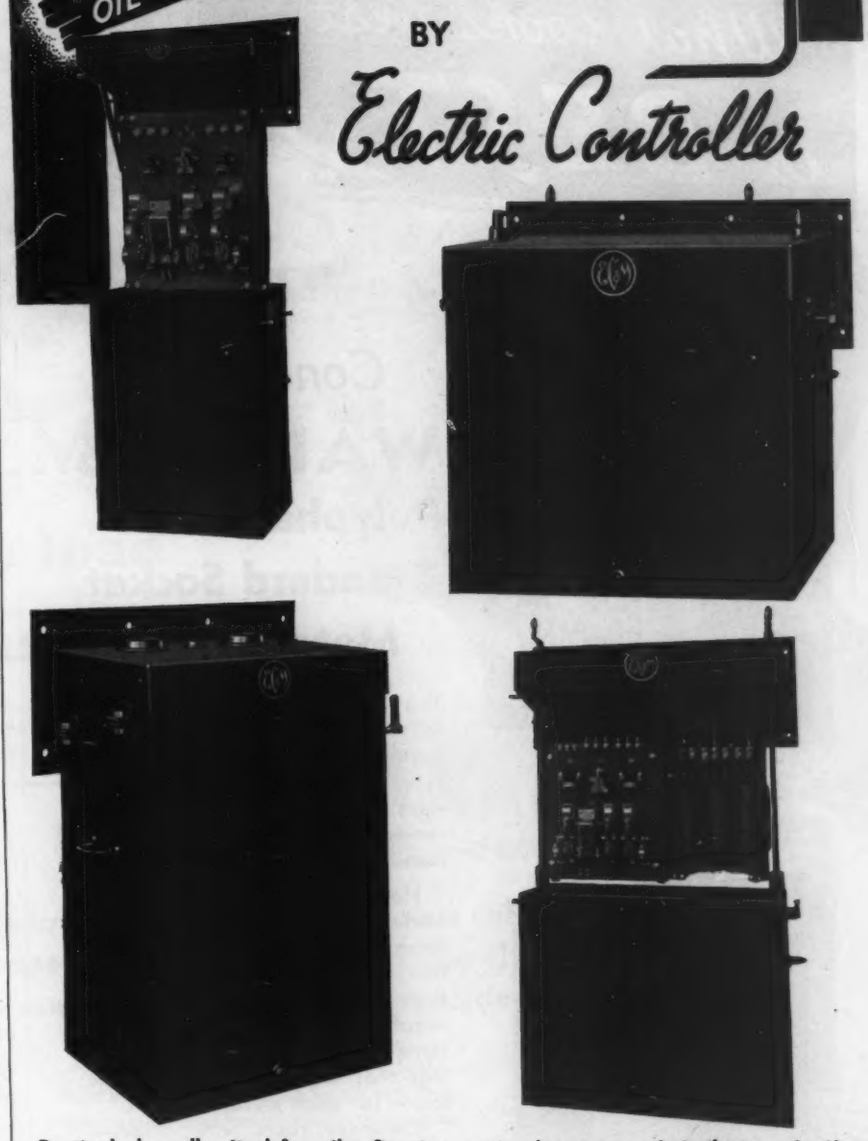
▶ RAY HORAN, who has had more than 20 years of varied consumer and industrial selling experience, has been appointed in charge of distributor and dealer sales training operations for the air conditioning and commercial refrigeration department of General Electric Co., Bloomfield, N. J.

▶ GEORGE DUBORG has taken over new duties as manager of the Williamsburg, Va., district of the Virginia Electric & Power Co. He succeeds WALTER I. DOLBEARE, who was transferred to Suffolk to become manager of that district. Mr. Duborg was formerly employed in the New York office of the Engineers Public Service Co. He has had wide experience in public utility operation, having held executive positions with the Gulf States Utilities Co. in both Louisiana and Texas and with the Western Public Service Co. in Nebraska. Mr. Dolbeare went to Williamsburg from Richmond eighteen months ago.

▶ W. C. NOLL has been appointed manager of product service for the General Electric appliance and merchandise department, Bridgeport, Conn. In this position he will co-ordinate and be responsible for service on all products of the department, as well as for the operation of all field service shops handling G. E. appliances. Mr. Noll has had 30 years of service with General Electric.

▶ DR. ARTHUR KORN has been appointed a member of the faculty of Stevens Institute of Technology as professor of electrical engineering. Dr. Korn attended the Universities of Leipzig and Freiburg and received his doctorate in 1890. After further studies in several European universities he became a lecturer and later a professor at the University of Munich. Subsequently he held a professorship in electrical engineering at the Berlin-Charlottenburg Technische Hochschule. He resigned from the faculty of the

NEW Design OIL-IMMERSED WALL MOUNTED STARTERS FOR 110-550 VOLT MOTORS BY Electric Controller



Particularly well suited for oil refineries, grain elevators and similar applications where explosive atmospheres are present. On the left are shown open and closed views of a 200 HP, 440 Volt Full Voltage Motor Starter for a South American oil refinery.

At the right is shown a primary reactor starter for reduced voltage starting of a 50 HP, 440 Volt motor in a Michigan oil refinery. This starter is equipped with self-contained screw-type mechanism for lowering the oil-tank. Mail the coupon below for Booklet No. 88 describing these and other EC&M custom-built motor starters.

THE ELECTRIC CONTROLLER & MFG. CO. E&M CLEVELAND, OHIO

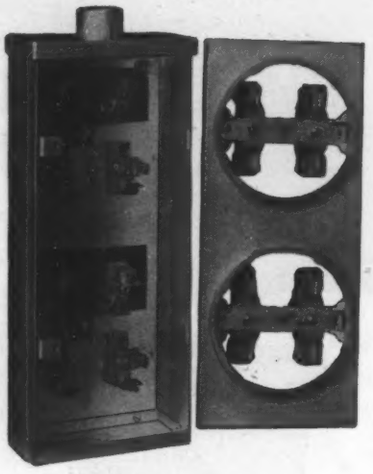
HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS.

THE ELECTRIC CONTROLLER & MFG. CO.
2708 E. 79th St., CLEVELAND, OHIO

Gentlemen:
Please send me a copy of Illustrated Booklet No. 88 describing EC&M 110 to 550 volt Motor Starters.

Name .....

Company..... Address.....

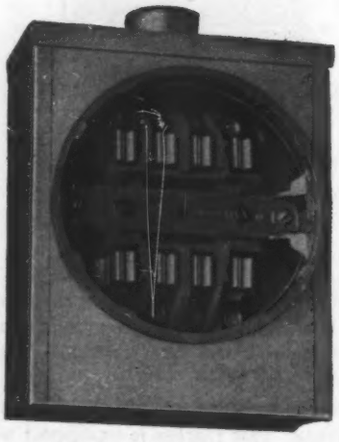


Concerning
WALKER'S
Polyphase *and*
Standard Socket Meter Troughs

This isn't an intricate problem—for Walker daily proves the eye-appeal and quality values of their socket meter troughs through many sales in supplying your electrical needs, and who meet your demands for the best equipment.

Here's why Walker Socket Meter troughs are best: superior finish, sturdy, modern construction; new extruded integral ring that guarantees perfect waterproofing; new type disconnect and terminal; convenient cover fastenings that require use of only one screw for each meter location.

Compare them with others—then see your nearest Walker jobber and see the quality of Weco Socket Meter Troughs.



Write for Catalog No. 8

WECO ATLANTA

WALKER
ELECTRICAL COMPANY
ATLANTA, GEORGIA

latter institution in 1935. Dr. Korn's work has been largely in the fields of mathematics and theoretical physics. He has been a pioneer worker for more than thirty years in the field of picture transmission over telephone circuits and by radio, in applications of photo-electricity, and in allied phases of weak-current engineering. Dr. Korn will offer two evening graduate courses at Stevens during the second semester. His subjects are "Picture Transmission Engineering" and "Introduction to Electromagnetic Theory."

▶ALBERT L. O'BANION, formerly electrical engineer of the Sumner traffic tunnel at Boston, Mass., has been appointed superintendent of the fire alarm division of the Boston fire department. Mr. O'Banion received his bachelor's degree in electrical engineering at the University of Texas and the degrees of E.E. and M.E. at Cornell University, teaching in both institutions. Later he became professor of electrical engineering at Clemson College, and for a time was on the teaching staff at Wentworth Institute, Boston. His field experience includes service at the plants of the General Electric Co., and Simplex Wire & Cable Co., and consultation work with the Silas Mason Co., contractors for the Sumner tunnel. In his most recent position he devoted much attention to problems of cable sheath electrolysis.

OBITUARY

▶HARRY R. ALLENSWORTH, consulting engineer, of Columbus, Ohio, died at his home in that city November 30, after a long illness. Mr. Allensworth was well known as a valuation engineer and was frequently called upon to testify in public utility cases. He was a member of the American Institute of Electrical Engineers and of the Western Society of Engineers.

▶JOHN F. G. MILLER, 62, vice-president of the B. F. Sturtevant Co., Boston, Mass., and president of the American Air Conditioning Manufacturers Association, died suddenly at his home in Brookline, Mass., on December 9. He was a native of Indiana, and after being graduated from Purdue University in 1903 became a sales representative of the American Blower Co., Detroit. In 1916 he was appointed sales manager, later being general manager, vice-president and a member of the board of directors. He joined the Sturtevant organization in 1933. Mr. Miller was a director of the National Association of Fan Manufacturers and a member of various engineering societies.

Is that REMOTE tie-line load rising unsafely?

Or, do you know at headquarters, from the continuous chart record of Bristol's Metameter System of Telemetering that loads at remote centers are all within safe line capacities?

In the efficient, safe operation of your power network, facts alone count. And facts are what Bristol's Metameter gives you—in the form of continuous easy-to-read chart records—for every moment of the day and night—facts on load, changes in power demand, in voltage—at remote points in your system, any distance up to several hundred miles away.

For example, is the tie-line load at a critical point rising? Your Metameter Receiver at headquarters tells you instantly. You know what is going on in sufficient time to take any necessary corrective action.

Consisting of just three principal parts, Bristol's Metameter System of Telemetering is a simple, low-cost method for the remote measurements of electrical and other quantities. It offers a number of advantages that should be of help to you in solving your own problems. Write for Bulletin 530E.

THE BRISTOL COMPANY
WATERBURY, CONNECTICUT
Branch Offices: Akron, Birmingham, Boston, Chicago, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco, Seattle. Canada: The Bristol Company of Canada, Limited. Toronto, Ontario. England: Bristol's Instrument Company, Limited, London, N.W.10

METAMETER FEATURES AT A GLANCE!

Readings are transmitted as a function of time. Accuracy is not affected by the characteristics of the transmitting channel.

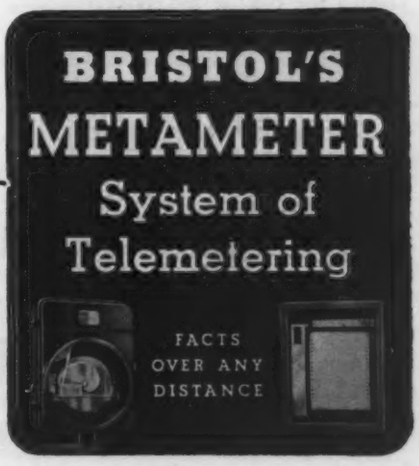
Particularly suited for operation over channels commonly available in power systems.

For use between transmitter and receiver, any two-wire circuit or its equivalent is suitable including private wires, telephone circuits or carrier channels.

Telemetering is possible over any distance,—with record made on a strip chart or a large easy-to-read circular chart.

Simple in construction. Only three principal parts—transmitter, receiver and inter-connecting circuit. Transmitter and receiver are self-contained instruments. Together they weigh less than 40 lbs.

Now used not only for electrical quantities, but also for telemetering fluid pressure, water level, temperature, flow, mechanical motion and gate position. Hundreds of installations today in successful operation in forty-two states and five foreign countries.



MANUFACTURING - MARKETS

Distributors Shown Hotpoint 1940 Line

More efficient and speedier electric ranges at lower prices were shown to nearly 150 distributors at the Biloxi (Miss.) Hotpoint Partners meeting last week. The 1940 range line also has fewer models.

There were also shown the new features in the other products of the Edison General Electric Appliance Co., including laundry, kitchen sanitation, refrigeration and water heating equipment. Simplified and easier financing terms were announced, as were new promotion and dealer selling helps.

Estimates for next year are conservatively placed at 10 per cent increase. For the entire industry range sales are estimated for 1940 at 350,000, against 300,000 this year. Water heaters are expected to go to 130,000. A survey of the range sales for the first nine months of this year showed 71 per cent for dealers and 29 per cent for utilities.

Because of greater saturation refrigeration sales are not expected to reach the 1937 peak. Replacement sales are expected to increase to 25 per cent of total. The 1940 sales are estimated at 2.000,000 units, against 1,800,000 in 1939.

Home laundry equipment is estimated for 1940 at $55,000,000, against $48,700,000 for 1939. This latter figure is approximately 16 per cent over 1938.

The place of housing projects, both federal and private, was indicated by estimates of 300,000 refrigerators this year and twice that number next year. Ranges are expected to go from 95,000 this year to 100,000 next.

•

Oil Burner Shipments

Domestic shipments of oil burners during October totaled 34,264 units, compared with 35,038 in September and 20,637 in October a year ago, according to the Department of Commerce. For the first ten months, such shipments numbered 177,277 units, against 114,906 in the same period of last year.

•

Vacuum Cleaner Sales Up

Vacuum cleaner sales in October totaled 137,901, compared with 119,805 in October, 1938, an increase of 15.1 per cent. In September of this year sales totaled 120,708. Sales in the ten-month period of 1939 were 1,138,152, an increase of 7.3 per cent over the 1,-060,214 recorded for the same period of 1938. C. G. Frantz, executive secretary of the Vacuum Cleaner Manufacturers' Association, announced that it was the industry's best October since 1936.

Square D Directors Vote Merger Plan

Directors of the Square D Co. have approved a proposal for a merger with the Kollsman Instrument Co., Inc., largest domestic organization devoted exclusively to the manufacture of aircraft instruments. The announcement was made jointly by F. W. Magin, president of Square D, and Paul Kollsman, head of the instrument company. A special meeting of stockholders of Square D has been called for December 28 to ratify the plan.

Terms of the merger provide for the delivery of $2,000,000 of new preferred stock and 35,000 common shares of Square D to the Kollsman company, plus either an additional $1,000,000 of

HOT POINT EXECUTIVES—President George A. Hughes (right) going over last-minute plans just before the Hotpoint Partners meeting last week at Biloxi with Vice-President R. W. Turnbull, Chairman W. H. Booth and General Manager A. D. Byler

THIS TYPE IS THE MOST EFFICIENT ONE FOR YOUR NEW MACHINE AND HERE'S WHY—
Monitor
BALTIMORE, MD.
The Original
JUST PRESS A BUTTON System

AUTOMATIC ELECTRIC MOTOR CONTROL

Monitor builds standard controllers, starters, and accessories, also custom-built apparatus for any electric motor control problem, no matter how complex. Monitor sales engineers in principal cities will gladly consult with you.

Good Motors-Good Machines Deserve Monitor Controls

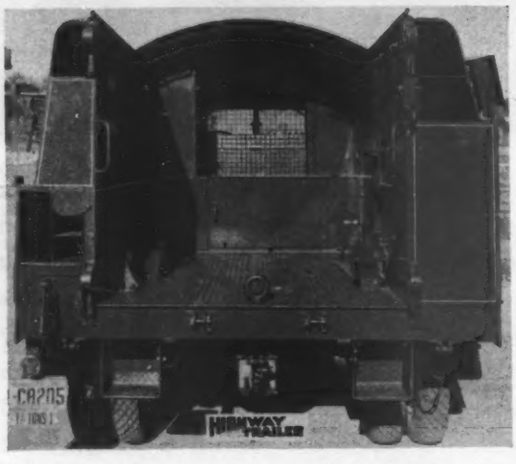
The control demands of motor-driven apparatus differ so widely that selection of the right one depends on a thorough knowledge of *all* types. Such specialized experience is available to you gratis through the nation-wide organization of Monitor Engineers. In practically every important city we have placed a skilled technician who will quickly grasp the control problem involved and work with your engineers toward a prompt and economical solution. His recommendations will be backed by a firm that has a lifetime reputation for doing things right . . . Your phone will put you in touch with us immediately.

MONITOR CONTROLLER CO.
BALTIMORE MARYLAND

Monitor UP TO 1200 Amperes Controllers

NEWLY DESIGNED
HIGHWAY
BODY

WIDER - MORE ROOMY ADDITIONAL CARRYING SPACE, YET LIGHT WEIGHT, COMPACT . . . . . RUGGED . . . . .



- The body is made of rust-resisting metal
- Compartments for light and heavy tools and materials well placed to provide correct loading and proper distribution of weight — this means proper balance on each side. Bulk of load is carried forward of rear axle.
- Cab facilities for 5-man crew with comfort
- Exceptionally fine appearance of value in promoting public good will.

The cab and body are two individual units allowing flexing of frame over rough terrain conditions to relieve strain on frame and prevent damage to cab and body. A safety feature is the location of major tool cabinets on curb side so men are not endangered when loading or unloading on highways or streets. There is no excess weight on springs. You get economical operation—long life service—performance with much less maintenance.

HIGHWAY STANDARD BODIES ARE ADAPTABLE TO EVERY LINE AND MAINTENANCE NEED

HIGHWAY TRAILER CO.
EDGERTON WISCONSIN

preferred stock or an additional 35,000 common shares, as it may elect. Stockholders of Square D, at their special meeting, also will be asked to ratify a new issue of $3,000,000 of 5 per cent cumulative convertible preferred stock issuable under the merger proposal. Mr. Kollsman will be associated with Square D as an officer and in a consultative capacity for three years from January 1, 1940.

Subject to the approval of the Square D stockholders, the merger is to be consummated prior to December 31. Under the merger terms the Kollsman business would continue as an independent unit, with its products manufactured and sold under the Kollsman name and with no change in executive staff, personnel or policies.

•

Earnings Reported by Manufacturers

For the nine months to September 30 Weston Electrical Instrument Corp. and subsidiaries report net profit of $317,296, equal, taking into consideration the $34,197 dividend paid on class A stock for the period and under the participating provisions of the shares, to $2.43 each on 13,642 shares of no-par $2 cumulative participating class A stock now outstanding and to $1.68 each on 160,583 shares of no-par common shares. Net profit last year was $97,704, equal, after dividend requirements on class A stock, to 35 cents a share on the common.

Among the other companies recently issuing profit statements are the following:

McGraw Electric—Twelve months to September 30: unaudited net profit, $1,287,040, equal to $2.72 a share on 472,600 stock shares, compared with $764,582, or $1.61 a share, for the twelve months ended September 30, 1938.

Birtman Electric—Including subsidiaries, September quarter: Net income, $99,759, equal to 73 cents a share on the common stock, against $71,537, or 50 cents a share, in the same quarter a year ago.

Copperweld Steel—September quarter: net earnings, $219,129, after all charges including depreciation and provision for federal and state income taxes. After allowance of $25,000 for quarterly dividend on the company's new preferred stock, these earnings are equivalent to 44.9 cents per share on 431,714 outstanding shares of common stock. These figures are subject to audit and year-end adjustment.

New York Metal Prices

	Dec. 12, '39 Cents per Pound	Dec. 6, '39 Cents per Pound
Copper, electrolytic	12.50*	12.50*
Lead, A. S. & R. price	5.50	5.50
Antimony	14.00	14.00
Nickel, ingot	35.00	35.00
Zinc, Spot	6.39	6.39
Tin, Straits	51.00	52.00
Aluminum, 99 per cent	20.00	20.00

*Delivered Connecticut Valley.

Field Reports on Business

While holiday buying is showing a progressive increase, there are signs of some leveling off in industrial activity. Purchases have become spotty. Year-end inventory situations are being considered, which is holding back some advance buying. Some new generating capacity, not already announced, is being considered.

NEW ENGLAND

A steady pace in buying electrical equipment holds throughout New England. Motor sales are strong; last week an order for one lot of 5-hp. motors was received from a prominent Massachusetts machine builder and several lots were placed for Rhode Island tool manufacturers. Switch and control apparatus sales are in good volume and orders for central station supplies continue with an encouraging trend.

Viewing this district as a whole, the electrical market buoyancy is reflected in large government orders for diversified uses. B. F. Sturtevant Co., Boston, has received an order from Owens-Illinois Glass Co. for air-conditioning systems to be installed in five of that company's plants; recently Fuller Brush Co., Hartford, Conn., installed a second electrically heated plastic molding machine which has a capacity of 190 combs per minute.

Concord (N. H.) Electric Co. is making studies for the modernization of its Sewall's Falls hydro-electric station at an estimated cost of about $700,000. Six leading Vermont utilities report having completed 556 miles of rural electrification during the last 3½ years. Doble Engineering Co., Medford Hillside, Mass., has developed four new apparatus units for testing electrical insulation.

Factory expansion is under way quite widely throughout this area and new lighting installations are being rushed to accommodate firms whose new business is taking on increased proportions. Department store sales for the past month improved; indications point to an encouraging seasonal activity in electrical appliances.

PACIFIC COAST

Holiday buying began early and is brisk. Cautious advance orders by dealers were reflected in moderate factory orders by wholesalers, and shortages of desirable items are predicted. Home building reached its peak in early November and the FHA year records 20 per cent increase to date over 1938. Plans are being prepared for Los Angeles' sixth housing project, a 685-family tract close to the civic center. A recent electrical contract of $72,215 out of a basic award of $1,500,000 and an estimate of 2 kw. for each family are figures which give an idea of the contractors', wholesalers' and utilities' immediate part in such projects.

Recent orders have included approximately 3,000 fractional-horsepower motors for pressure pumps, depth finders, calculating machines and small pumping outfits, and much special cable for mining, dredging, and street lighting installations. Low bids for the Minedoka project in Idaho were about $70,000 for turbine, $89,000 for generator and governor and $19,000 for transformers, circuit breakers and disconnect switches. Machinery buying by municipalities records an award of $50,423 by Glendale for four Pennsylvania 8,333-kva. transformers, $30,996 by Burbank for steam-condensing unit and a request by Burbank for bids on two steam-generating units and by Alburquerque on a gas and electric plant.

Industrial buying is slower except for shipbuilding industry. The ten cargo carriers now being built in the Bay region will be 100 per cent electrically welded, consuming an estimated 5¼ million kw.-hr. in the process.

NEW YORK

The stand which the SEC has taken in the Consumers Power financing has disturbed the utility market and is likely to have profound effect in future financing. Also, the present intention of the SEC to move immediately to bring the entire industry into integration proceedings is being weighed for its effect on construction and expansion programs for 1940.

Trade in this area began to catch the holiday spirit this week, with stores reporting higher sales. There is a wide variety of stocks on hand and the belief is that there will be no critical year-end inventory problem.

Electrical appliances have been in demand, with indications that stocks will be short by the time the new 1940 models reach the market early next month.

Industrial production is being well maintained. There are signs of some leveling off in new business gains. In the Pittsburgh area the index of business remains unchanged. This is the first time since early August that the index failed to advance.

CHICAGO

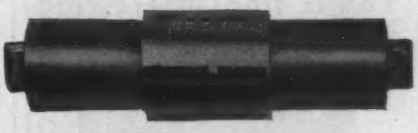
Further advances were reported all along the business front last week. Retail trade expanded rapidly as holiday buying forged ahead sufficiently to the point where merchants are predicting the largest sales volume in ten years. Electric appliances are moving at a rate from 10 to 50 per cent above last year. Large mail order houses report sales at new high levels, while the turnover of wholesalers' stocks show gains of 20 to 30 per cent over a year ago. Industrial activity continued steady at comparatively high levels, with production in the steel mills maintaining near capacity levels.

Working on accumulated orders, electrical manufacturers expect to maintain a relatively high rate of production well into next year. Utility buying continues to increase as additional expansion programs are undertaken.

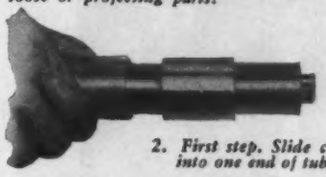
All electric kitchens and laundries will be installed in a 554-unit apartment project now under construction. There will be a total of 1,462 pieces, including ranges, refrigerators, washers and ironers. Eleven central plant air-conditioning systems were installed in Chicago in November, as compared with five in the same month last year. Dealers sold four electric room coolers, as against three in the same month last year. Electrical power output last week showed an increase of 10,000,000 kw.-hr. over the previous week.

NOBOLT CONNECTORS

• A New Principle • for Joining Tubular Buses



1. *NOBOLT connector ready for installation. No loose or projecting parts.*



2. *First step. Slide connector into one end of tubular bus.*

3. *Below . . . Slide other end of connector into end of other bus to be joined.*

4. *Tapered key forces patented self-locking wedges apart, firmly locking connector to bus ends.*

5. *Completed connection. Note neat, smooth appearance; no larger than outside diameter of tubing. Perfectly adapted to Micarta tubing insulation. Withstands 3-ton pull-out.*

What Engineers Have Been Looking For!

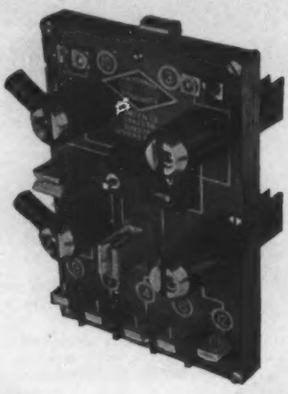
NOBOLT connectors come in all shapes and sizes, from ¾" s.p.s. and up. Positively produce high-pressure contacts by patented internal expansion features. Cannot vibrate loose. Easily and quickly put on or taken off — all you need is hammer and removable tapered key (furnished free). Cost no more than old-fashioned bolted-type connectors. Send for Catalog B.

• SHELDON •
SERVICE CORPORATION

2415 43rd Ave.
Long Island City, N. Y.

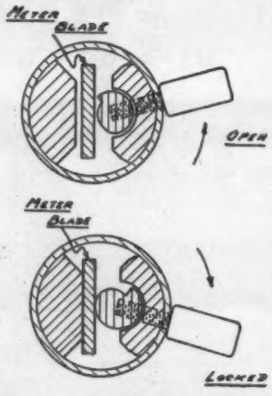
STATES TESTING EQUIPMENT

A New
TEST JACK
FOR SOCKET METERS
You'll find Interesting



for 2-3 wire self-contained single phase and net work polyphase meter testing

See how easy it is to operate—



1. Lever-actuated cams aid quick and easy operation.
2. Laminated base gives strength and long life.
3. Adjustable potential tap gives added protection.
4. Diagram of internal connection on face and back of base.
5. Steel reinforced test terminals.
6. All buss light weight aluminum.

Full details gladly sent. Write.

THE STATES COMPANY 3 New Park Ave. Hartford, Conn.

Complete Customer Coverage Sells Lamps to 51 per Cent

[*Continued from page 43*]

simple to sell a Pin-It-Up lamp. Approximately 30 per cent more I.E.S. lamps were sold in this activity than in that of the previous year.

As the third month of the program began the employees were also given a standard carton of Mazda lamps to sell, which also stimulated Pin-It-Up sales. Many employees, unable to sell many I.E.S. or Pin-It-Up units, were able to do their share of the over-all job on carton sales. They found, in discussing carton sales with certain customers, they were able to close many Pin-It-Up sales which had not appeared likely to them before.

Employee commissions were 25 cents per unit on the Pin-It-Up lamps. Commissions varying from 75 cents for the table model to $1.50 for the six-way floor model I.E.S. lamps were paid. The commission for a "Light Conditioning" carton of Mazda lamps (one 100-watt, one 75-watt, three 60-watt, one 40-watt) was 15 cents. Commissions paid on other Mazda lamp assortments were, roughly, 10 per cent of the retail price.

Individual prizes for the greatest percentage of customers sold were offered as well as other and smaller prizes for sales volume. A competition between districts, based entirely on the highest percentage of domestic customers sold, helped maintain competitive and enthusiastic spirit throughout the program.

Final results shown in the accompanying data were beyond all pre-campaign expectations. We had felt that if it were possible to sell as many as 40 per cent of our domestic customers a 100-watt Pin-It-Up lamp, the results both from a revenue secured basis and future acceptance of better lighting would be satisfactory. Instead, 51 per cent were sold.

•

Co-op. Changes Name

Fillmore County (Minn.) Co-operative Electric Association has changed its name to the Tri-County Electric Co-operative Association and is moving its offices from Preston, Minn., to Rushford, Minn. The organization has also approved an amendment increasing its capital stock, and another increasing the number of directors from each county from two to three and adding one director at large.

"SHOPPING CENTER" of the Electrical Industry!

Another Important Reason Why

GOOD ADVERTISING *Pays* IN ELECTRICAL WORLD

Results that please—Here's a bold statement, but we'll stand by it: When you have something needed by the electrical industry... and when you advertise it consistently in Electrical World in persuasive, hard-hitting copy, Electrical World will produce satisfying results, viz.:

CRESCENT TOOL COMPANY of Jamestown, N. Y., is a splendid example. This well known manufacturer uses full pages in ELECTRICAL WORLD to promote its line of electrical tools. And the copy is down-to-earth . . . it's informative . . . it *sells*. It is easy to see why R.B. Warman of Landsheft & Warman, Inc., Buffalo advertising agency, can say:

"In looking through some of our old records, we find that our client, Crescent Tool Company, Jamestown, N. Y., began using space in ELECTRICAL WORLD in January, 1927. Aside from a brief interruption in 1933, we have carried a regular schedule in ELECTRICAL WORLD.

"Our client has been highly pleased with the results that this advertising has produced. We have had several opportunities closely to check its effectiveness. In one case we made our initial announcement of a new type of sleeve wrench in ELECTRICAL WORLD. Before any other advertising, either direct mail or trade paper, was released, we had a very definite response from utilities all over the country proving that the advertising pages of ELECTRICAL WORLD are seen and read by the men we want to reach.

"Our experience with ELECTRICAL WORLD on the Crescent account leads us to believe that it is one of the most effective of the many trade papers being used on our various industrial account schedules."

PACIFIC ELECTRIC MANUFACTURING CORP. of San Francisco and Gary is another good illustration. Way back in 1907 this company started telling the readers of "WORLD" about its products (switchgear). In 1939 Pacific was still telling its story to our readers—in regular, fact-filled, convincing color pages. And this is what H. L. Brooke, Sales Manager, says about it:

"One of the ways for a buyer to *know* that a product is good is to see it reiterated in ELECTRICAL WORLD.

"We have been impressed by the effectiveness of modern advertising in ELECTRICAL WORLD in informing buyers of the advantages built into our products. We believe that our 1939 series of advertisements in ELECTRICAL WORLD has helped our products 'sell themselves' and has been an important factor in increasing our sales this year."

Men's views may differ as to exactly what constitutes "satisfying results"—but, as you will note, one central theme runs through all these letters: Consistent advertising in Electrical World, with well-planned copy, is producing RESULTS for all of them.

ELECTRICAL WORLD

Serving a Huge and Ever-Growing Market

A McGraw-Hill Publication, 330 W. 42nd St., N.Y.C.

No. 3 of a series of factual messages designed to demonstrate that GOOD ADVERTISING *in a leading business publication will invariably produce worth-while results*

CENTRAL

Linemen's Flare Lights

BRILLIANT ILLUMINATION WHERE YOU WANT IT WHEN YOU WANT IT

A quickly available light—burns either 20 or 30 minutes in any weather. Instantly lighted with friction cap ignition—no matches required.

Linemen's Flares provide well-diffused light, eliminating the shadows and glare of "spot light" illumination. Can be stuck in a pole or cross arm or carried in the hand.

Ideal warning signals for truck breakdowns or when power lines are down on highways.

PACKING

#3020 20 min. 72 per case—63 lbs.
#3030 30 min. 36 per case—50 lbs.

Central Railway Signal Company, Inc.

NEWTON, MASS.

SEND THIS COUPON NOW

Please send me complete information and prices on Linemen's Flare Lights.

NAME .....

COMPANY .....

ADDRESS .....

Utilegalities

By WILLIAM L. GROSSMAN

Instructor in Public Utilities, New York University

Original Cost—Now What? Now that the original cost accounts required by the Federal Power Commission and many of the state commissions are in use two questions necessarily arise: First, will the availability of book figures purporting to represent original cost lead the Supreme Court to permit the use of such cost (or perhaps of "prudent investment") as a rate base? So far the court has successfully side-stepped this question. Second, how will the difference between original cost and former book cost or future cost of acquisition be amortized? Will amortization be included in the regular depreciation allowance or among the income deductions? The former alternative would disappoint those anti-utility interests that expected something sensational to result from the new systems of accounts, and the latter alternative would inevitably cause conflict with the courts. Looking at the matter in relation to rates, will the commissions attempt to make the stockholder bear the burden of bringing utility plant accounts down to an original cost basis? Or will rates be increased to permit rapid amortization as part of operating expenses? Rather modest, in view of the magnitude of these problems, is the requirement of the New York Public Service Commission that "the utility shall notify the commission as to its program for depreciation, amortization or other disposition of the amounts included in this account."

* * *

Indirect Control Do commissions regulate the return earned by utility service and management companies, even if such companies are not public utilities? In case there remains any uncertainty on this subject, note the recent decision whereby the Pennsylvania Public Utility Commission approved an arrangement under which the return to a service company (Equitable Auto Company, servicing companies in the Standard Gas & Electric system) was limited to 6 per cent. A reading of the opinion strongly suggests that the commission would have disapproved the agreement if the rate of return to the service company had been too high. And if there is still any doubt about the correct answer to our question, take a look at Rule U-13-32, in which the SEC permits subsidiary service companies only "reasonable compensation for necessary capital procured through the issuance of capital stock . . ."

It is interesting to remark that this control is exercised indirectly—by the SEC under its power to attach conditions when it grants authority to a subsidiary service company to conduct its business, and by the Pennsylvania Commission under its power to approve or disapprove certain service contracts. Once upon a time there were constitutional restrictions on the efforts of government officials to do indirectly what they cannot do directly.

* * *

Distrust of Book Value In a decision dated November 7 the Georgia Public Service Commission found that "little weight can be given to the values reflected on the books of the Company (Georgia Power & Light Company) as an element in the determination of the fair value of the company's electric property." This is significant in relation to the movement for reform of plant accounts, for such reform has inspired white-hot enthusiasm chiefly because of the naive belief that commissions habitually rely on the book value of plant in the determination of reasonable rates. Yet we are reminded continually—as in the quoted decision—that nothing could be farther from the truth. Popular opinion to the contrary notwithstanding, public service commissions in the more populous states have expressed a distrust of book value that amounts at times almost to a presumption against its validity.

* * *

When Is a Write-up? "The recording of actual cost, though in excess of original cost — certainly when paid in cash in a transaction in which there is arm's length bargaining —is not generally regarded as a write-up." So says the SEC (*in re* Columbia Gas & Electric Corp.). The idea apparently is that if a utility company pays a fair price for its property, the mere fact that a prior owner paid less for it doesn't make the fair price "inflationary." Too bad the Federal Trade Commission didn't recognize that fact when it included such so-called write-ups in the billion and a half dollars of inflation which it attributed to the utilities.

Ironically, it was the Federal Trade Commission's findings and recommendations that resulted in enactment of the Public Utility Holding Company Act, in the administration of which act the SEC finds itself constrained to utter this repudiation of the elder commission's point of view.

Superposition Experience Discussed by A.S.M.E.

[*Continued from page 39*]

With increasing output difficulties were experienced with slag accumulations on the sloping portion of the secondary-furnace wall to thicknesses of 4 to 12 in. Removal by hydrojet was ineffective. Bottoms were changed in December, 1937, and all furnace slag is now readily removed in liquid form through the slag-drip holes of the primary furnace. Failures of vertical slag-screen tubes and ruptures of tubes around slag-drip openings were also experienced. Correctives consisted in (1) the addition of twelve recirculating tubes between upper slag-screen header and lower distribution header, (2) offsetting alternate groups of two slag-screen tubes in the secondary furnace, and (3) moving burners forward 2 ft. 10 in.

The radius of tube bend in tubes around slag-drip holes was also increased and water cooling coils installed at slag openings to retain a deeper protective layer of molten slag over the floor tubes.

Position of soot blowers was changed for more effective cleaning of the heating surface. The supply-header piping was changed to secure higher pressure at the blower heads and higher jet velocity.

"In general, it appears that the tube failures . . . have been largely due . . . to sluggish circulation . . . the matter of solid water downcomer supply is particularly important, as is also the matter of ample return-circulating-tube area. It would also appear that where relatively high heat transfers occur parallel circulation with unequal flow resistance should be avoided . . ."

Logan (1,000,000 lb. per hour, 1,250 lb., 925 F.)—The boiler is still the largest built to date. Ash-screen tube failures resulted from impaired circulation and excessive heat input. Tubes of smaller diameter with spiral circulating strips and increased slope were substituted and burner angles readjusted.

Slagging has not been serious and cleaning of boiler tubes by soot blowers and lancing has been easily accomplished; ash-fusion temperatures range from 2,350 to 2,700 F. Load swings of 100,000 to 150,000 lb. per hour are readily handled. Steam temperature has been controllable

Why take chances on dirty, oil-soaked or wet insulation, when you can test it so easily?
Insurance Engineers take no chances
WHY SHOULD YOU?

Photo by Courtesy of Eagle-Globe-Royal Indemnity Companies and Pennsylvania Sugar Company

When the engineers of the Eagle-Globe-Royal Indemnity Companies make a periodic inspection of electrical equipment which they insure, they take no chances on the insulation—they test it with a "Megger" Insulation Tester.

By this simple procedure and without risk of unnecessary breakdown, they penetrate unseen conditions caused by dirt, moisture and deterioration, and decide whether the insulation is in good or poor condition.

Hundreds of thousands of similar recorded tests made by leading Insurance Companies, as well as tests made independently by Operating Engineers, have shown that periodic insulation testing is an indispensable procedure for preventing unexpected electrical breakdown and unnecessary outages and repairs.

Why take chances? Whether you carry electrical insurance or not, you want to avoid electrical breakdown. "Megger" testing is the practical way to go about it.

"MEGGER"

TRADE MARK REGISTERED U.S. PAT. OFF.

Write for a copy of our Pocket Manual of "Megger" Practice, No. 1420-W.

JAMES G. BIDDLE CO.

1211-13 ARCH STREET PHILADELPHIA, PA.

"Always thought we could find a better way to get fire protection than by stuffing those bushings with asbestos. Next time we'll fix them the slick way they show in the NEW LAPP CATALOG. Lots of ideas in that book."

IF YOU HAVEN'T GOT A NEW LAPP CATALOG WITHIN QUICK REACH, YOU NEED IT . . . WRITE LAPP INSULATOR CO., INC., LE ROY, N. Y.

Crapo GALVANIZED PRODUCTS

Steel Strand
Telephone and Telegraph Wire
Where strains and stresses are heaviest, where corrosion takes its greatest toll, Crapo Galvanized Steel Strand and Telephone Wire constantly are proving their outstanding superiority. The heavy, tenaciously bonded zinc coating, maximum tensile strength and correct ductility insure longer life and lower maintenance cost. Insist upon Crapo Galvanized Products for better performance under all conditions! Ask your Jobber or write direct!
INDIANA STEEL & WIRE CO.
MUNCIE, ♦ INDIANA
Crapo Galvanized Strand and Telephone Wire can be obtained readily in all standard grades and sizes.
INDIANA STEEL & WIRE CO.
MUNCIE, IND.

within prescribed range by means of the remotely operated by-pass dampers. With tangential firing a minimum boiler load of 300,000 lb. per hour can be attained without loss of flame stability. A load of 175,000 lb. per hour has been carried successfully for a two-hour period when using both gas and coal as fuel. Four auxiliary natural-gas burners are used for starting and they are capable of carrying, themselves, a boiler load of 50,000 lb. per hour.

Saturated steam from the boiler has a specific conductivity of from 0.5 to 0.7 micromhos. Even so, some fouling of turbine blades has been experienced, but, fortunately, this seems to be greatly reduced following a turbine shutdown.

South Omaha (265,000 lb. per hour, 1,200 lb., 900 F.)—Generation of steam by this high-pressure unit has been at 75 per cent unit output factor for the entire service period.

Deficiency in total steam temperature persists, correction having been delayed. Slagging of boiler-unit heating surfaces must be fought continually, the Kansas coal burned having relatively high sulphur content and low ash-softening temperature (1,850-2,100 F.). Boiler is now normally operated during the day at approximately 225,000 lb. per hour. It requires fourteen man-hours per day for cleaning the heat transfer surfaces.

No circulation troubles have been experienced in boiler or furnace walls or arches and the traveling-grate stoker has developed no operating or maintenance difficulties, notwithstanding its great size.

Pulverizer Mill Performance

Waterside—Performance of the mills has been uniformly good. They run quietly and very little trouble has been experienced other than replacement of rollers at the end of their expected normal life. Average life of rollers is 85,000 tons; scrapers, 18,000 tons; bull rings 85,000 tons. Only two grades of coal ("Colver" and "Revloc") have been used.

Logan—Four Hardinge mills, each of 15 tons per hour capacity, have been rendering satisfactory service with a power input of 16 kw. each at full capacity. They have handled more than 350,000 tons of coal. Exhauster plates made of boiler plate require replacement after 35,000 tons; wear on the ball charge amounts to 0.086 lb. per ton.

Feedwater Treatment

Waterside—The Hall treatment is used and consists of an average of 86 lb. of disodium crystallized phosphate (per 24-hour day for two boilers) and 21 lb. of sodium hydroxide. Boiler concentration is held at 450-500 p.p.m. now that boiler-drum baffles have been installed.

Logan—Evaporator supplies feedwater make-up in the form of coagulated river water in which temporary hardness usually predominates, forming a scale in the evaporator not readily susceptible to cracking. Approximately 0.2 p.p.m. of tannin is added to the evaporator feed for 1 p.p.m. of hardness.

Boiler Feed Pumps

Waterside—Four of six are motor-driven and two turbine-driven, the latter capable of being brought up to speed almost instantaneously. Availability of the Worthington pumps has been 97.6 per cent and there has been practically no maintenance except normal packing of the glands. One difficulty with the steam-driven pumps has been failure of the leak-off valve from the outlet header to the suction header. The trouble was overcome by putting two valves in series with a pipe provided with labyrinth orifices to build up resistance to flow through the valves.

Logan—Three identical 3,600-r.p.m. feed pumps are installed, one motor-driven and two turbine-driven, the former usually standby. Their performance has been satisfactory in every way except for the minor matter of failure of ring gaskets involved with the removable head at the discharge end where the balancing disks are located.

South Omaha—"The shaft of one of the 3,600-r.p.m. steam-driven feed pumps failed completely. The majority of opinion is that this resulted from imperfections in shaft material."

•

Utility Plant Approved

SEC has approved the proposed $2,000,000 power plant addition to Virginia Public Service Co. property at Alexandria, Va. The addition calls for the erection of a 15,000-kw. steam turbine generator set.

Recent Rate Changes

WISCONSIN PUBLIC SERVICE CORP., starting a program that may result in rate reductions of $200,000 during 1940, will reduce rates to 51,200 home users of electricity in 145 communities of 20 northeastern and central Wisconsin counties about $40,000 a year. The Wisconsin Public Service Commission announced the reduction, which will be effective on bills issued about January 1. The company has agreed if its earnings continue approximately at the present level further reductions in residential, commercial, and power rates will be made during 1940 to bring total reductions up to $200,000.

CENTRAL ARIZONA LIGHT & POWER CO. will reduce electric rates in Phoenix and other valley communities, effective January 1, approximately $200,000 a year, W. M. Cox, chairman of the Arizona Corporation Commission, has announced. The new rate schedule was filed with the commission by the light and power company after conferences between officials of the company and the commissioners. The new residential rate will be 2 cents per day and 3½ cents per kilowatt-hour for the first 120 kw.-hr., 2½ cents per kilowatt-hour for the next 130 kw.-hr. and 2 cents for all additional kilowatt-hours, plus tax. The rate now in effect is 2 cents a day and 4 cents per kilowatt-hour for the first 100 kw.-hr., 3 cents per kilowatt-hour for the next 90 kw.-hr. and 2 cents per kilowatt-hour for all excess kilowatt-hours, plus tax. The new commercial lighting and power schedules applying to customers with a demand of 3,000 watts or less will be 2 cents per day and 3½ cents per kilowatt-hour for the first 500 kw.-hr., 2½ cents per kilowatt-hour for the next 2,000 kw.-hr. and 1½ cents per kilowatt-hour for all additional kilowatt-hours, plus tax. The present commercial lighting schedule is 2 cents per day and 3 8/10 cents per kilowatt-hour for the first 500 kw.-hr., 3 cents per kilowatt-hour for the next 1,500 kw.-hr. and 1½ cents per kilowatt-hour for all additional kilowatt-hours, plus tax.

ROCKLAND LIGHT & POWER CO. has filed a general reduction of residential, commercial and power electric rates with the New York Public Service Commission which is estimated to save consumers $200,380 annually. The commission gave the company special permission to make the reduced rates effective December 1.

CENTRAL NEW YORK POWER CORP. has filed a reduction of the residential rate applicable in and near the city of Utica which is estimated to save customers approximately $126,000 annually. The change reduces the Utica residential rate to the level of the rate in the Syracuse city district and the Capitol district of the New York Power & Light Corp. and will affect the bills of nearly 28,000 residential customers in Utica and its immediate vicinity. Two other residential rates applicable in outlying territory are not changed.

ARKANSAS UTILITIES CO. has been directed by the state Utilities Commission to reduce its residential electric rates $23,800 annually in Helena and Marianna. The reduction, approximately 10 per cent, was based on the 1938 revenue of the company. Commission Chairman Thomas Fitzhugh stated that the order resulted from mutual agreement between the commission and the utility.

SALAMANCA, N. Y., has filed a general

You, too, should attend this great exposition

THE AIR CONDITIONING EXPOSITION
SIXTH INTERNATIONAL HEATING & VENTILATING EXPOSITION
CLEVELAND · OHIO
January 22-26 1940

THOUSANDS of electrical men know from experience that their interests are promoted by attending the International Heating & Ventilating Exposition. You can profit in the same manner whether your work includes selling, buying, planning, designing, installing, operating or servicing any part of a heating, ventilating or air conditioning system.

See the outstanding new developments of more than three hundred exhibitors . . . have demonstrations made for you . . . talk to exhibitors . . . get suggestions . . . bring yourself thoroughly up-to-date here in only five days. More than thirty thousand visitors are expected. They know from past years that it pays to go. You too are cordially invited to attend.

THE AIR CONDITIONING EXPOSITION
6th INTERNATIONAL HEATING & VENTILATING EXPOSITION
LAKESIDE HALL CLEVELAND, OHIO
Auspices American Society of Heating & Ventilating Engineers · Management, International Exposition Co.
JANUARY 22-26, 1940

Acme Bias Tapes are

Every run of tape is thoroughly tested **CONSTANTLY TESTED** —for *tensile strength*, as above, for elongation (stretch) and for dielectric strength. These tests are made according to A.S.T.M. standards, but must exceed them by a wide margin . . . . a point to remember when specifying insulations.

The Acme Wire Co., New Haven, Conn.

ACME WIRE PRODUCTS

VARNISHED INSULATIONS — MAGNET WIRE — COILS — CAPACITORS

Do you want to CUT COSTS?
Blackburn "Gripits"
COST ONLY
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revision of electric rates with the state Public Service Commission which is estimated to save customers of its electric plant $6,200. The commission gave the city special permission to make the revisions in the rates effective December 1, except that the commission suspended a proposed change in the industrial power rate of the plant and directed that a hearing be held concerning the propriety of the change proposed in the rate.

CONCORD, MASS., MUNICIPAL ELECTRIC LIGHT BOARD has announced a rate reduction saving domestic users $12,600 annually. The new schedule is effective January 1.

ILLINOIS COMMERCE COMMISSION has announced that electric rate revisions effective during the month of November resulted in an estimated aggregate reduction of $16,750 in annual operating revenues.

WISCONSIN PUBLIC SERVICE COMMISSION has announced that approximately $162,000 will be saved annually by 38,660 public utility customers in Wisconsin through rate reductions ordered or authorized in October.

•

Municipal Plants

PARAGOULD, ARK.—City Council has adopted a resolution authorizing Jeff Bratton, as special attorney, and A. Coleman, as city attorney, to file suit against the Arkansas Utilities Co., seeking damages for loss of revenue by the municipal light plant because of injunction proceedings filed by the company against the city from the time the city voted to build a plant in 1933 until it was put into operation last January. The attorneys have prepared a suit to be filed in the Greene County Circuit Court asking damages of $234,875, based on the earnings of the light plant from January 17 to October 14 this year.

CASCADE, IOWA—State Supreme Court has issued a ruling authorizing the town to start construction of a municipal light and power plant and upheld dismissal of an injunction suit brought by the Iowa Electric Co., in an effort to prevent construction. The utility company alleged that the adoption of a minimum wage scale for the project by the Council constituted such an interference with free and open competitive bidding that the contracts were void. The plant will cost $100,000.

HOT SPRINGS, N. M.—A movement to establish a municipal light and power plant or acquire the existing utility took form when the town Council entered into a contract with L. W. Cantelou & Co., consulting engineers, to make a survey for a municipal light and power plant as well as make an appraisal as to the value of the existing utility, owned by the New Mexico Public Service Corp. The town has given an option to the E. F. Hutton Co. to purchase up to $200,000 of revenue bonds with which to build the proposed new plant or acquire the existing one. The action anticipates use of power from the Elephant Butte hydro-electric plant.

PROVO, UTAH—Tentative agreement for the purchase by the city of distribution facilities of the Utah Power & Light Co. within city limits for a price of $160,000, effective April 1, 1940, has been announced. Purchase includes everything on the system within the city except the high-voltage transmission lines and the substation at Second North and Second West streets, which will be retained to carry their service to other parts of the county and surrounding districts. Under the tentative agreement, the power company will sell the municipality any power the city lacks on a separate basis and also will provide standby service, at a rate to be agreed upon. The city plant is now well under construction and should be ready by April 1, Mayor Anderson stated. The power company's franchise expires on January 27. A proposal to give the utility another ten-year franchise was voted down by Provo citizens at the city election November 7.

•

Allots $1,871,000 for Rural Projects

Allotments totaling $1,871,000 for rural electrification projects or systems in six states have been announced by Harry Slattery, Administrator of Rural Electrification. These allotments provide for three projects in Alabama and for the establishment or enlargement of projects in Georgia, Tennessee, Mississippi, Pennsylvania and West Virginia.

Together they brought the total of allotments made by REA since its establishment to $266,736,293. Among the recent allotments were the following:

ALABAMA—Butler County Electric Membership Corp., Greenville, Edwin H. Wallace, supt., $123,000 to build 160 miles of line, 456 members in Butler, Lowndes, Dallas, and Wilcox counties. Pea River Electric Membership Corp., Clayton, Arthur B. Robertson, supt., $111,000 to build 145 miles of line, 379 members in Barbour, Henry and Dale counties. Wire Grass Electric Co-operative, Inc., Hartford, J. W. Bass, president, $292,000 to build 388 miles of line, 877 members in Geneva, Houston and Coffee counties.

GEORGIA—Blue Ridge Electric Association, Inc., Young Harris, Everett C. Nicholson, supt., $45,000 to acquire and build 40 miles of line, 256 members in Towns, Union, and Fannin counties, Ga., and Clay County, N. C.

MISSISSIPPI—Pontotoc Electric Power Association, Pontotoc, L. E. Price, supt., $238,000 to build and acquire 101 miles of line, 1,541 members in Calhoun and Chickasaw counties. Four-County Electric Power Association, Columbus, Louis Wise, supt., $404,500 to build and acquire 232 miles of line, 2,253 members in Clay, Lowndes, Noxubee, Oktibbeha and Monroe counties. East Mississippi Electric Power Association, Meridian, Grady W. Smith, supt., $47,500 to acquire existing distribution lines in Kemper County. Tombigbee Electric Power Association, Tupelo, Keith Barnett, president, $51,000 which, in conjunction with a WPA grant will construct 108 miles of line, 621 members in Lee, Union, Monroe, Prentiss and Itawamba counties.

PENNSYLVANIA—Southwest Central Rural Electric Co-operative Corp., Indiana, S. J. Orange, supt., $57,000 to build 52 miles of line, 182 members in Indiana and Armstrong counties. Cambria Electric Co-op., Inc., Ebensburg, Edward

Jones, president, $134,000 to build 114 miles of line, 443 members in Cambria County.

TENNESSEE—Board of Public Utilities, Paris, John Sweeney, supt., $140,000 to build 109 miles of line, 771 consumers in Henry County. Weakley County Municipal Electric System, Martin, Hall Arnold, supt., $55,000 to build 55 miles of line, 346 consumers in Weakley County. Knoxville Electric Power and Water Board, Max C. Bartlett, acting manager, $94,000, which in conjunction with a WPA grant, will build 140 miles of line, 986 members in Grainger, Knox, Union, Sevier and Jefferson counties.

WEST VIRGINIA—Harrison Rural Electrification Association, Inc., Clarksburg, Wilson J. Brent, supt., $79,000 to build 78 miles of line, 323 members in Harrison, Barbour, Upshur, Lewis, Doddridge, Marion and Taylor counties.

The following allotments were made earlier in the month of November:

MISSOURI—Co-Mo Electric Co-op., Inc., Jack Needy, supt., Tipton, $147,000 to build 142 miles of line, 480 members in Cooper, Moniteau, Morgan and Camden counties. Howell-Oregon Electric Co-op., Inc., L. L. Bryan, president, West Plains, $322,000 to build 310 miles of line, 782 members in Howell and Oregon counties.

NEBRASKA—Polk County Rural Public Power District, G. E. Ekstrand, supt., Stromsburg, $50,000 to build 45 miles of line, 87 members in Polk County. Dawson County Public Power Dist., Thomas C. Guilfoyle, supt., Lexington, $30,000 for the installation of irrigation pumps and motors for 50 members of the project.

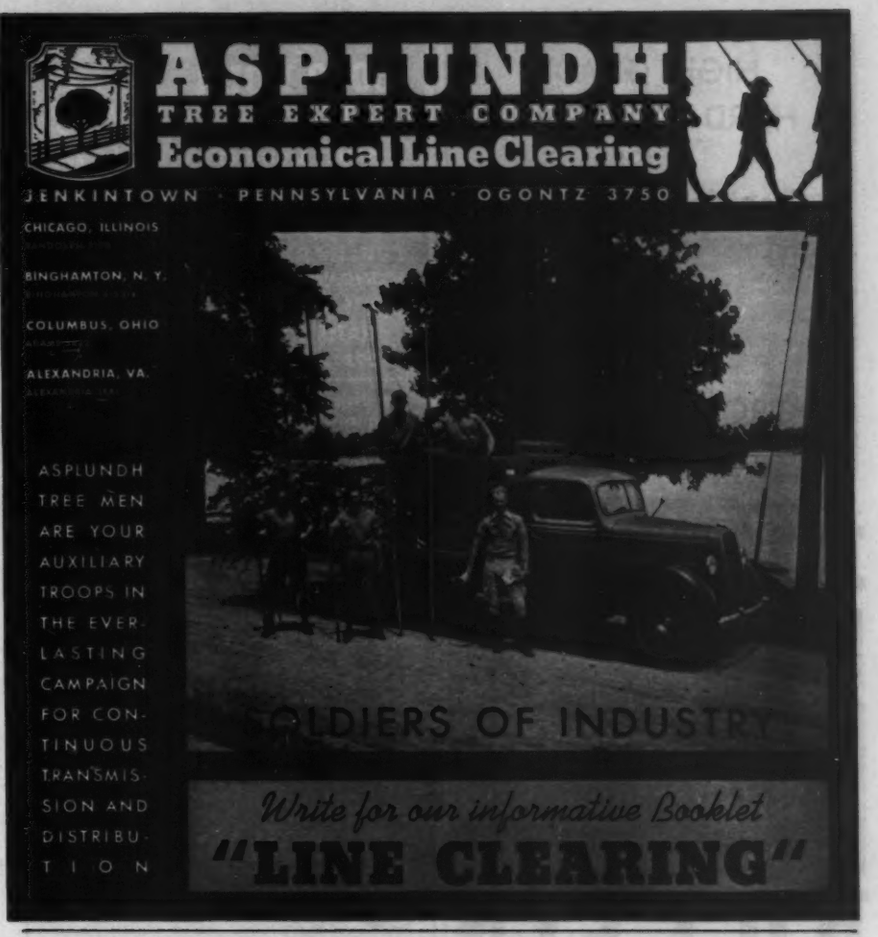
NORTH CAROLINA—Davidson Mutual Electric Corp., A. P. Siner, supt., Lexington, $77,000 to build 54 miles of line, 168 members in Davidson and Randolph counties.

New Deal Denies Anti-Utility Drive

[*Continued from page 54*]

pointed out, would be to swell the cost of the whole project way out of reason, and make it very difficult, later on, to justify "yardstick" rates for electric power.

This is the project, it will be recalled, so roundly denounced back at its inception by J. N. (Ding) Darling, who was brought into the New Deal by President Roosevelt to conserve wild life and became outraged at the idea of destroying one of the best wild life refuges in the world to build a power plant in a section of the country already adequately supplied with electricity. The Administration hated to alienate one of the great cartoonists of the world, especially on the eve of a presidential election. But public power marches on, so far as the New Deal is concerned. Appeasement or force—but appeasement is so much easier!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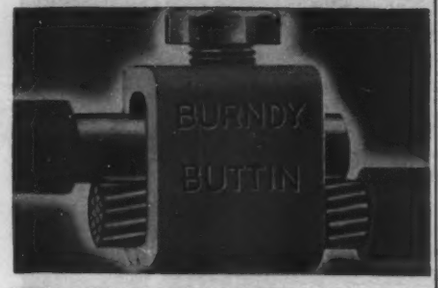

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Measurement of Motor Vibration

[*Continued from page 47*]

not any other vibrations that may be introduced through or by the mounting. Since this is impossible, this condition is approached by taking advantage of the fact that rubber, under a certain tension or compression, will not transmit vibration impulses of a certain frequency.

Rubber mountings supporting a motor under these conditions approach the equivalent of 100 per cent isolation, because motor vibration is not transmitted through the supports to the platform on which the motor rests. These rubber supports are calculated for a definite range of motor weights and speeds and specially made for this service. For a certain motor and speed the platform has to be deflected downward a specified distance in order to furnish the per cent of isolation standardized by the N.E.M.A.

Vibration readings may be taken with either a piezo-electric pickup amplifier, where amplitude of vibration is proportional to the amplitude of a voltage generated by vibration impulses on a piece of rock salt, or with a vibrometer, where the amplitude of vibration is indicated on a ground-glass scale as a band of light formed by a light beam reflected from a vibrating mirror. An electric generator of the reciprocating solenoid type with suitable amplifier and attachments is also in current use.

The amount of motor vibration is observed in three positions: (1) Horizontally against shaft-end bearing housing: (2) endwise against shaft-end bearing housing; (3) horizontally against bearing housing at the other end of the motor. Vibration is observed at the operating speed or speeds of a constant- or multi-speed motor and through the entire range on an adjustable-speed motor.

The nature of the band shown on the vibrometer often indicates the source of vibration. Aside from plain unbalance, motor vibration may also be due to bearings, uneven air gap, stator-rotor slot combinations (in case of a.c.), improperly centered float on sleeve-bearing motors, etc. A uniform vibrometer light band indicates a recurrent and regular vibration, probably due to plain unbalance in the rotating member. If it is pulsating in width, it indicates two

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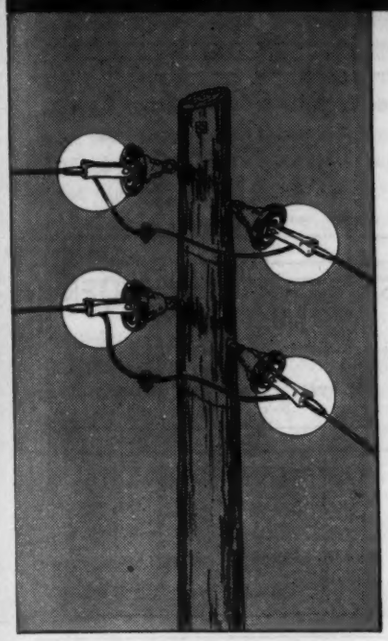

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superimposed vibrations of different frequencies. If very ragged, an irregularly recurring impulse, very likely due to bearings, is indicated. Of course, it is possible for all three conditions to be present at once. With the motor properly isolated by rubber suspensions, the vibration amplitude may be as low as 0.0003 in. for special-purpose motors and up to 0.002 in. for some general-purpose motors.

This co-operation among all the leading motor manufacturers has eliminated the possibility of confusion arising from the use of several methods for taking motor vibration readings, has raised vibration standards and consequently has improved the quality of the product.

Fluorescents Aid Work in Windowless Factory

[*Continued from page 49*]

allowing the plant to absorb all noise and vibration as near the point produced as possible. In order to maintain this condition, of course, it will be absolutely necessary that the air always be completely free from dust and dirt.

All dust and exhaust gases developed in production operations will be removed at their sources through underground networks of ducts. Thirty-two dust removal units will serve many times that number of machines through under-floor ducts connecting each unit with other machines in the same area.

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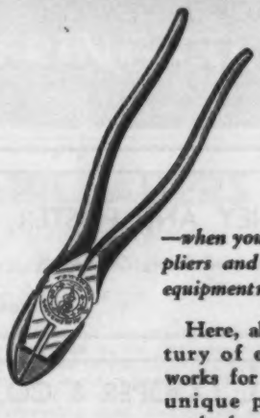

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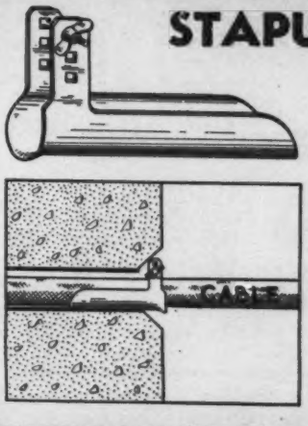
German Export Trade

For the benefit of American manufacturers and exporters of electrical equipment who may seek to capture a portion of Germany's war-stricken electrical export trade, John H. Payne, chief of the electrical equipment division of the Bureau of Foreign and Domestic Commerce, has prepared a detailed tabulation of Germany's exports for 1938. During that year Germany had exports valued at about $134,395,000.



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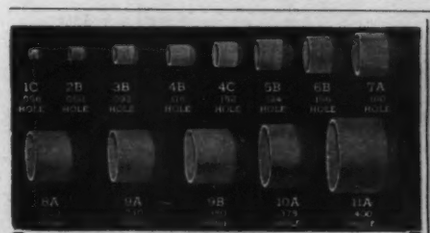

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Sales Opportunities

SAVANNAH, GA.—Savannah Electric & Power Co. plans expansion and improvements in Riverside steam-electric generating plant, including installation of additional equipment for increased capacity. Cost estimated close to $300,000. Proposed to begin work early next spring.

PENSACOLA, FLA.—Public Works Officer, Naval Air Station, receives bids (no closing date stated) for electric generator set, switchboard, electrical distribution system and auxiliary equipment for emergency service at station.

SABINA, OHIO—City Council has plans maturing for extensions and improvements in municipal power plant and waterworks station, with installation of additional equipment. Bond issue of $60,000 has been authorized for work. Fosdick & Hilmer, Union Trust Building, Cincinnati, Ohio, are consulting engineers.

INGLESIDE, TEX.—Humble Oil & Refining Co., Humble Building, Houston, Tex., plans installation of motors and controls, regulators, conveyors, electric pumping machinery and other equipment in connection with expansion and alterations in oil refining plant at Ingleside. Proposed to begin work soon. Cost reported over $2,000,000.

KAUKAUNA, WIS.—Utilities Commission, H. F. Weckwerth, superintendent, will take bids soon for switchboard, instruments, controls and miscellaneous equipment for installation in municipal hydroelectric power plant. Also for new outdoor power substation and equipment. Mead, Ward & Hunt, State Journal Building, Madison, Wis., are consulting engineers.

BATESVILLE, ARK.—Arkansas Power & Light Co., Pine Bluff, Ark., plans extensions in transmission and distributing lines in vicinity of Batesville, for increased service in Ruddell Hill and neighboring districts.

SAN FRANCISCO, CALIF.—Constructing Quartermaster, Fort Mason, San Francisco, receives bids until December 21 for construction and completion of extensions to electrical distribution and street-lighting systems at Hickam Field, T.H.

BATTLE CREEK, MICH.—Wilcox-Rich Division of Eaton Manufacturing Co., 9771 French Road, Detroit, Mich., manufacturer of automobile engine equipment, plans installation of motors and controls, conveyors, electric hoists and other apparatus in new addition to branch plant at Battle Creek, on which work will begin soon. Cost about $175,000, of which close to $100,000 will be expended for mechanical and electrical equipment.

CLEVELAND, TEX.—Gulf State Utilities Co., Beaumont, Tex., plans new power substation at Cleveland. Also will make extensions and improvements in primary and secondary lines for increased service in that area.

WINDSOR, W. VA.—West Penn Power Co., Pittsburgh, Pa., plans extensions in transmission lines in conjunction with new addition to steam-electric generating station at Windsor, owned jointly with Ohio Power Co., Newark, Ohio. Also will make extensions in switchyard at power station, as well as switching stations for line service. Addition to generating station will comprise installation of new 60,000-kw. turbine-generator unit and accessories, for which contract, it is understood, has been awarded to General Electric Co.

PLYMOUTH, WIS.—City Council is considering installation of new switchboard and other equipment in municipal electric power plant. Bids are scheduled to be asked soon.

FORT MILL, S. C.—Springs Cotton Mills, Lancaster, S. C., plan installation of motors and controls, transformers and accessories, regulators, conveyors and other equipment in new two-story addition, 200x 300 feet, to branch mill at Fort Mill. Work will begin at early date. Cost estimated close to $250,000.

RUSHFORD, MINN.—City Council has authorized surveys and preliminary plans for new municipal electric power plant. Cost estimated about $80,000. Ealy G. Briggs, 1957 University Avenue, St. Paul, Minn., is consulting engineer.

WASHINGTON, D. C.—Bureau of Yards and Docks, Navy Department, Washington, receives bids (no closing date stated) for outdoor power substation at local Naval Research Laboratory, including transformers, switchgear and auxiliary equipment, with grounding system and non-climable fence.

MIAMISBURG, OHIO—City Council, Joseph E. Poduk, service director, is considering extensions and improvements in municipal electric power plant, including installation of a turbine-generator unit, boiler and stokers, and auxiliary equipment. Estimates of cost will be made as soon as an engineer is engaged to prepare plans. Leo Wall is city engineer.

ROBY, IND.—American Maize Products Co., 135 South LaSalle Street, Chicago, Ill., plans installation of motors and controls, conveyors, transformers and accessories, loaders and other equipment in new additions to mill at Sixth and 113th Streets, Roby, including a four-story unit for dextrose department; five-story structure, 42 x 52 feet; and two one-story buildings, 75 x 250 feet, and 50 x 80 feet, respectively, for expansion in different starch-manufacturing divisions. Cost estimated about $250,000. Work will be placed under way soon. Sargent & Lundy, 140 South Dearborn Street, Chicago, are consulting engineers.

WASHINGTON, D. C.—Bureau of Yards and Docks, Navy Department, Washington, receives bids until December 20 for coal and ash-handling systems for navy yard, Pearl Harbor, T.H., including receiving hopper; feeder and crusher; bucket elevator; steam-vacuum ash, soot and fly-ash conveyor; storage tanks; dust-removal apparatus; motors, controls and accessory electrical equipment; piping, etc.

ABERDEEN, S. D.—City Council plans installation of improved lighting system in connection with expansion and improvements in municipal airport, including revolving beacons, boundary lights, controls, etc. Approval and recommendations are being secured from Civil Aeronautics Authority, Washington, D. C.

SHEBOYGAN, WIS.—Wisconsin Power & Light Co., Madison, Wis., is having plans drawn by Sargent & Lundy, 140 South Dearborn Street, Chicago, Ill., consulting engineers, for proposed extensions and improvements in Edgewater electric generating station, Sheboygan, recently referred to in these columns. Installation will include a new 30,000-kw. turbine-generator unit and auxiliary equipment. Cost, including line extensions in Sheboygan area, switchyard additions, etc., estimated at $2,000,000. Work is scheduled to be carried out next year.